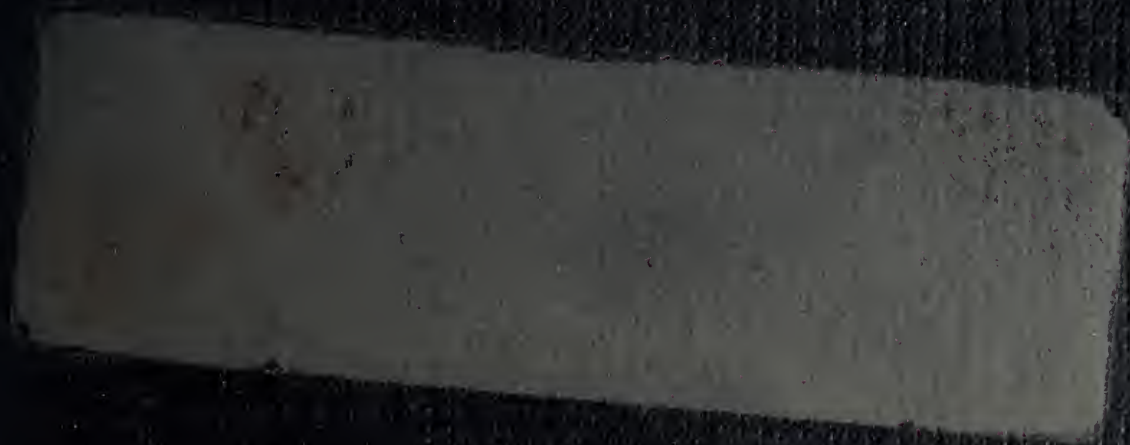
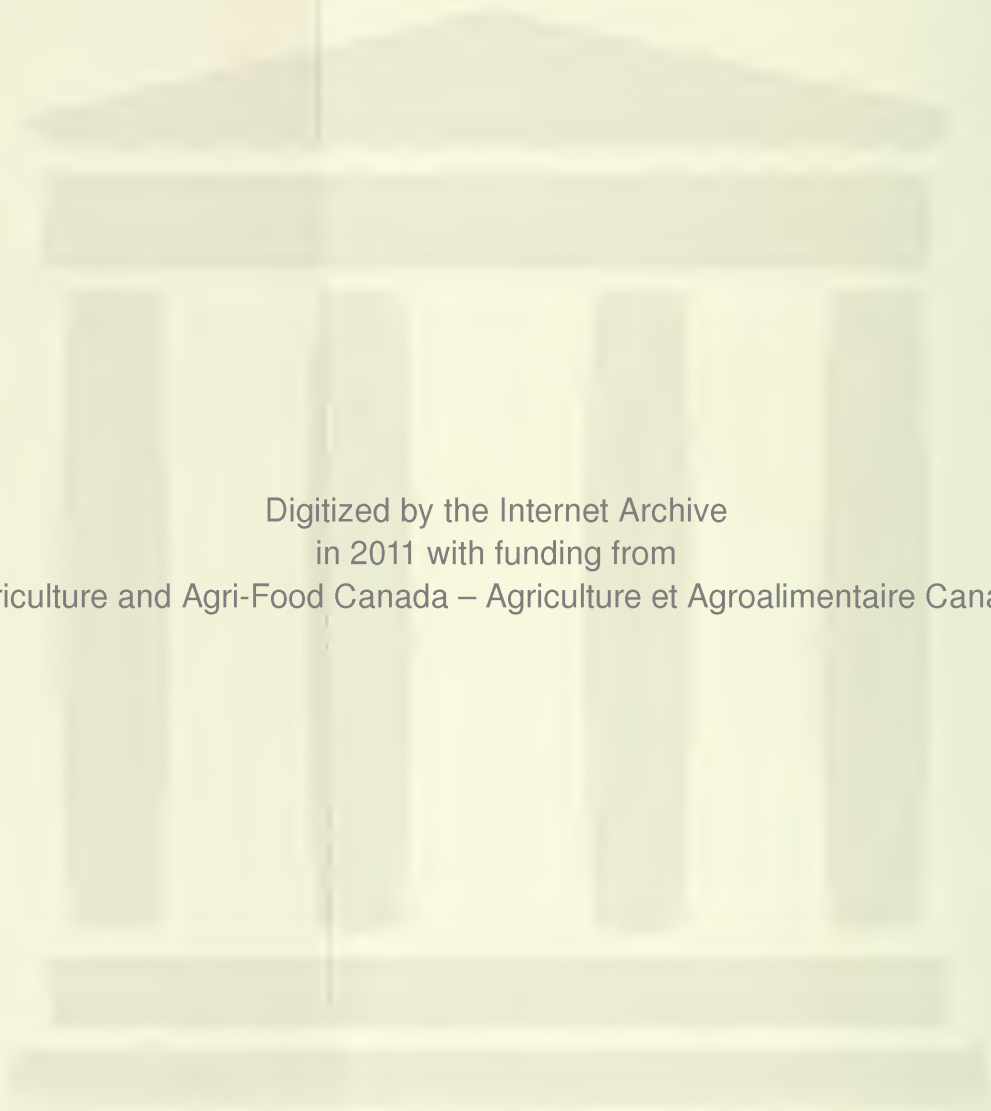


THE LUPINES
OF CANADA
AND ALASKA





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THE LUPINES OF CANADA AND ALASKA

DAVID B. DUNN
University of Missouri
Columbia, Missouri

and

JOHN M. GILLET
Plant Research Institute
Central Experimental Farm
Ottawa, Ontario

1966

Research Branch
CANADA DEPARTMENT OF AGRICULTURE
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1966



Wyeth's lupine (*L. wyethii* S. Wats.) presents a sea of blue under ponderosa pine.

INTRODUCTION

Taubert (1894) placed *Lupinus*, and the genera *Argyrolobium*, *Spartium*, *Genista*, *Pitteria*, *Erinacea*, *Laburnum* and *Calycotome*, in the tribe *Podalyrieae*, subtribe *Spartiinae* of the subfamily *Papilionoideae* of the Leguminosae. Linnaeus (1753) knew only six species of *Lupinus*: *L. perennis*, *L. albus*, *L. varius*, *L. hirsutus*, *L. angustifolius* and *L. luteus*, of which only the first is North American. In a monograph of the genus on a world basis, Agardh (1835) included 83 species, of which two are now excluded from the genus. Watson (1873) wrote a revision that included 53 species for North America. One of the most prolific of modern writers on the genus was C. P. Smith, who published a series of "signatures" under the title *Species Lupinorum* during the period 1938-1952. In this work of his late years, Smith added many names but little to an understanding of the genus because he became preoccupied with descriptions of minor variants known now to be chiefly single-gene differences, which are expressed in simple Mendelian ratios. Both D. B. Dunn and L. L. Phillips have brought a large measure of stability to the group by incorporating evidence from geography, cytology and conventional morphology. As a result of their work it is evident that a stable and practical taxonomy of *Lupinus* can be achieved only through an understanding of the biology of populations and the recognition of genetically significant groups.

The center of distribution of the genus is the western part of both North and South America and the Mediterranean area of Europe, Asia and Africa. Estimates of the number of species are somewhat inaccurate because of the plasticity of the populations and the very large number of names that have been applied to the group by various authors. The suggestion of 200 species by Turner (1959) and Smith (*in* Abrams, 1944) is reasonable for North America, although Hitchcock et al. (1961) gave a more conservative number of "probably 100 or more."

If we assume a monophyletic origin for lupine species, then it must follow that the western American and the Mediterranean populations were united at one time. Separation of the two groups probably took place in late Cretaceous or early Tertiary time and was complete by the Pliocene. Speciation then carried on independently in the two major centers, giving rise to two groups of related and comparatively recent (pre-Pleistocene) species. The distribution and relationships of the American species appear to support this hypothesis.

Table 1. Chromosome numbers of Canadian and Alaskan *Lupinus* species

Text No.	Species	<i>n</i>	<i>2n</i>	Author	Source
9	alpestris	not counted			
21	arboreus		48	Savchenko (1935)	Obtained from Sicily by Bragdo (1957)
7	arbustus	24		Phillips (1957) as <i>L. laxiflorus</i> var. <i>laxiflorus</i>	Omak, Okanagan Co., Wash. Winton, Chelan Co., Wash. Selah, Yakima Co., Wash. Mt. Hood, Hood River Co., Ore. Sisters, Deschutes Co., Ore. White Bird, Ada Co., Idaho
		48		Phillips (1957)	Lyle, Klickitat Co., Wash. Underwood, Skamania Co., Wash.

		24	Phillips (1957) as var. <i>pseudo- parviflorus</i>	Priest River, Bonner Co., Idaho St. Regis, Mineral Co., Mont.
25	arcticus	48	Holmen (1962)	
20	argenteus	48	Ledingham (1957)	Cypress Hills, Saskatchewan
		24	Phillips (1957)	Bridgeport, Baker Co., Ore. Pierce, Clearwater Co., Idaho Alberton, Missoula Co., Mont. Livingston, Park Co., Mont. Custer, Custer Co., S.D.
4	bicolor	24	Dunn (1956)	Counts on subsp. <i>microphyllus</i> and <i>umbellatus</i> , Los Angeles, Calif. and Santa Rose Island, Santa Barbara Co., Calif. respectively
28	burkei	not counted		
2	densiflorus	48	Tuschnjakowa (1935)	
12	formosus	not counted		
13	kuschei	not counted		
4	lepidus	24	Phillips (1957)	Spanaway, Pierce Co., Wash. Goldendale, Klickitat Co., Wash. Dayville, Grant Co., Ore. Ukiah, Umatilla Co., Ore. Modor Point, Klamath Co., Ore.
10	leucophyllus	24	Phillips (1957)	Thorpe, Kittitas Co., Wash. Spangle, Spokane Co., Wash. Goldendale, Klickitat Co., Wash. Pullman, Whitman Co., Wash. La Grand, Umatilla Co., Ore. Dixie, Baker Co., Ore. Boise, Ada Co., Idaho
		48	Phillips (1957)	Goldendale, Klickitat Co., Wash. Wapato, Yakima Co., Wash.
23	littoralis	24	Phillips (1957)	Hecata Beach, Lane Co., Ore.
15	lyallii	24	Phillips (1957)	Tollgate, Umatilla Co., Ore.
16	minimus	not counted		
26	nootkatensis	48	Maude (1940)	Recorded as a British species, perhaps misidentified
9	oreganus	24	Phillips (1957)	Silverton, Polk Co., Ore. (under <i>L. sulphureus</i> subsp. <i>kincaidii</i>)
18	parviflorus	not counted		
24	perennis	24	Phillips (1957)	Plymouth, Marshall Co., Ind. Amboy, Lee Co., Ill. Hanover, Lebanon Co., Pa.
3	polycarpus	48	Tuschnjakowa (1935)	
		24	Dunn (1956) as <i>L. micranthus</i>	Beverly Hills, Los Angeles Co., Calif.
27	polyphyllus	48	Savchenko (1935)	Novozibkov (south of Smolensk) White Russia
			Cooper (1936)	No source
			Bragdø (1957)	No source
		24	Phillips (1957)	Montsanto, Thurston Co., Wash. Mission Peak, Kittitas Co., Wash. Viola, Garfield Co., Wash. Livingston, Park Co., Mont. Oswego, Clackamas Co., Ore.

1	<i>pusillus</i>		48	Ledingham (1957)	Big Stick Lake, Saskatchewan
22	<i>rivularis</i>	not counted			
11	<i>sericeus</i>	24		Phillips (1957)	Maryhill, Klickitat Co., Wash. Big Timber, Sweetgrass Co., Mont. Gillette, Campbell Co., Wyo. Orofino, Clearwater Co., Idaho
8	<i>sulphureus</i>	24		Phillips (1957)	Kooskooskie, Walla Walla Co., Wash. Viola, Garfield Co., Wash.
5	<i>vallicola</i>	24		Dunn (1956)	Count on a hybrid of subsp. <i>vallicola</i> × <i>L. nanus</i> subsp. <i>menkerae</i> . <i>Vallicola</i> from Polo Alto, Santa Clara Co., Calif. and <i>menkerae</i> from Bakers- field, Kern Co., Calif.
17	<i>wyethii</i>	not counted			

The chromosome numbers of only five annual and 14 perennial species of lupine of our area are known (Table 1). They all have a haploid number of 24 with the exception of *L. arbustus*, which, according to Phillips (1957), has $n = 24$ and $n = 48$. Senn (1938) concluded that our present-day lupines have been derived from a 12-chromosome ancestor. On this basis species with $n = 24$ are tetraploids; those with $n = 20, 21, 25$ and 26 are probably derived aneuploids. Most of the species forming the aneuploid series occur outside of North America; however, one of them, *L. barkeri* Lindl. of Mexico, has $n = 25$ (Tschechow, 1931; Tushnjakowa, 1935). At least two American species, *L. subcarnosus* Hook. and *L. texensis* Hook., have a haploid number of 18 (Turner, 1957). *T. subcarnosus* was interpreted by Senn to be triploid, but, as shown by Turner (1957), plants of this species form 18 bivalents at meiosis. The data presented by Turner (1957) suggests that the basic chromosome number may be 6, in which case, plants with an $n = 24$ number would be octoploid. Studies of meiotic associations of chromosomes in artificial hybrids would help to clarify relationships among lupine species. However, knowledge of the identity of the plants used in a hybridization program is essential to a correct interpretation of such data.

Apparently the five annual species are morphologically distinct in Canada, but several of the perennial species intergrade along their margin of contact. Figure 1 shows the number of combinations of apparent morphological intergrades

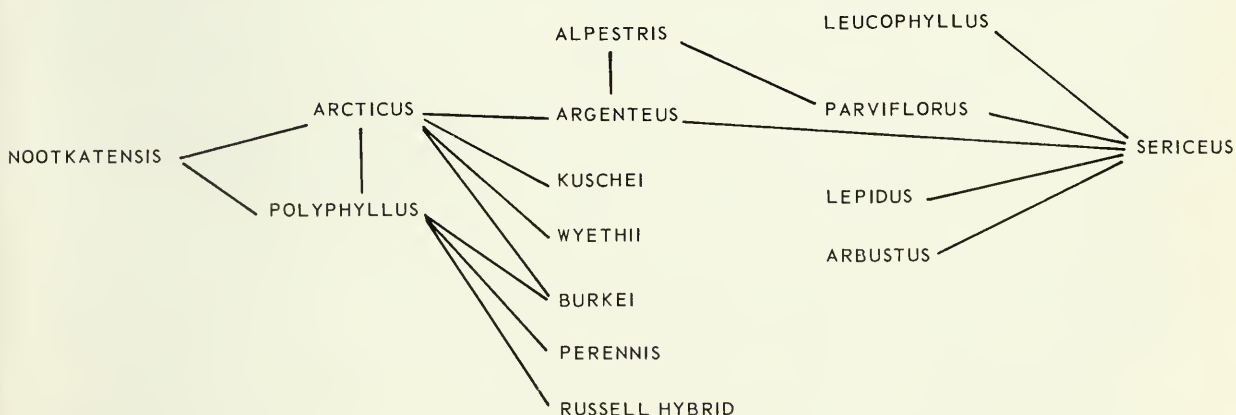


Figure 1. Introgression among Canadian species of *Lupinus*. Each line joins species known to intergrade.

between 16 of the 23 perennial Canadian and Alaskan species seen in herbaria. These 16 species are either in natural contact through contiguity of ranges or have been brought into contact by man; the other eight seldom come into contact with one another or have not been observed to intergrade. The existence of these morphologically intermediate plants shows that strong barriers to interbreeding have not developed between these species.

The difficulty of separating the perennial species in northwestern North America can be attributed to successive lupine migrations following the recession of the Pleistocene glaciers. The withdrawal of the ice enabled several formerly separated species to meet and to interbreed along their zones of contact. Hybridization is seen, for example, in the distribution patterns of *L. arcticus*, *L. nootkatensis*, and *L. polyphyllus* (Figures 69, 72 and 75, and Dunn, 1965), which come together in southern Alaska, southwestern Yukon and northwestern British Columbia. *L. kuschei*, which is restricted to a small, evidently glaciated area of southern Yukon, may have arisen as a result of such hybridization. Between successive waves of migration, it is possible that pockets of plants left behind crossed with newly invading species. In the southern portion of the range of *Lupinus* interbreeding has been aided by man. By his activities, species formerly isolated have been brought into contact. Some species have been introduced from one portion of the continent to another.

Because lupines are able to invade soils low in nitrogen they have become established in disturbed areas. This is the reason why certain species are used as cover crops for the enrichment of agricultural soils. A number of species from both the Old and New worlds are employed in horticulture because they have attractive flowers of various colors. The cultivated lupines are roughly divided into two groups, the large-seeded agricultural kinds and the small-seeded ornamentals (Bailey, 1958). Most of the ornamental species are annuals, as for example, *L. albus* L., *L. hartwegii* Lindl. and *L. pubescens* Benth., the latter often appearing under the name of *L. hybridus* Voss and including a large number of garden varieties. *Lupinus polyphyllus* Lindl., a perennial, has several particularly attractive pink color forms that have been given cultivar names, e.g., 'Bicolor,' 'Roseus.' *L. regalis* Bergmans is one of a number of hybrid perennials, probably of *L. polyphyllus* ancestry, which include the Russell lupines, Harkness hybrids and Downer's hybrids. Considering that many lupines are well adapted to northern climates and have handsome flowers, it is surprising that more species are not utilized in horticulture.

A number of lupine species have proved to be poisonous to cattle and sheep, but because of confusion in species names it is difficult to know for certain which ones are actually toxic. Toxicity is attributed to minor changes in the structure of active alkaloids known to be present in lupines (Kingsbury, 1964). However, those alkaloids that have been successfully isolated do not appear to be physiologically very active. We don't know positively which species are acceptable as forage. We do know that the susceptibility of livestock to poisoning varies, both seasonally and under varying range conditions. This may be due in part to a higher concentration of alkaloid in the seed than in leaves, so that preflowering lupines may be relatively safe, while hay which contains seed may be highly toxic. Lupines are hard to classify and any attempt to correlate poisoning symptoms and alkaloid content with species must be preceded by proper identification of the plants.

The following treatment of the lupines of Canada and Alaska is based on the collections of several Canadian herbaria, particularly those of the Plant Research Institute, Ottawa, Ontario; the National Museum of Canada, Ottawa; the Provincial Museum, Victoria, B.C.; the University of British Columbia, Vancouver; and the

University of Alberta, Edmonton; and several herbaria in the United States. The taxonomy and drawings are by Dunn; the coauthor wrote the introduction, edited the text and prepared the maps. Grateful acknowledgment is made to the curators of the herbaria mentioned above for making their material available for study.

LUPINUS L. Sp. Pl. 2: 721. 1753.

Annual or perennial herbs, in Canada; stems solitary or in dense clumps from a woody caudex, often branching above; glabrate or with various types of pubescence; stipules usually subulate, connate at the base or for as much as three fourths of the length; leaves either basal or cauline, alternate, palmately compound, with 5-17 leaflets; leaflets linear to oblanceolate or obovate; flowers perfect, pedicellate, in terminal, sessile or pedunculate racemes; calyx two-lipped, three sepals fused into an often nearly entire lower lip, the upper lip formed by two more or less connate sepals; corolla usually pale blue and white to deep blue or purple or lavender with a white to yellow spot on the banner, flowers sometimes all yellow, white or pink; wing petals generally fused at the tip; keel petals fused above and below for the outer half and often ciliate; stamens 10, monadelphous, 5 with large anthers alternating with 5 small anthers; legume violently dehiscent, 2- to several-seeded. (Latin, a wolf, since the plants often grow in poor soil and were thought to rob the soil.)

Type species: *L. albus* L. *ibid.*

Key to the Taxa

- A. Plants annual (B)
- AA. Plants perennial (F)
- B. Cotyledons sessile, connate (C)
- BB. Cotyledons petiolate; distinctly verticillate (D)
- C. Flowers scattered; corolla glabrous; northern plains 1. **pusillus**
- CC. Flowers verticillate; densely ciliate near the claws of the wings and keel; introduced on Vancouver Island, British Columbia 2. **densiflorus**
- D. Leaflets generally glabrous above, occasionally with a few scattered hairs; banner reflexed above the midpoint 3. **polycarpus**
- DD. Leaflets pubescent above; banner reflexed at the midpoint (E)
- E. Banner narrowly oblong; 6-9 mm long, 3-6 mm wide 4. **bicolor**
- EE. Banner suborbicular; 7-10 mm long, 6-11 mm wide 5. **vallicola**
- F. Upper lip of the calyx distended backward as a spur 0.5-3.0 mm long; the wings often pubescent laterally near the tip and the banner generally pubescent over the central area of the back (G)

- FF. Upper lip of the calyx not spurred, sometimes gibbous, distended back to 0.5 mm in *L. argenteus* var. *tenellus* (J)
- G. Keel ciliate below the claws as well as above, often also on the lower margin of the wings; sometimes with stiff setaceous hairs laterally ahead of the claws; the wings glabrous laterally near the tip
- GG. Keel ciliate above only; wings often pubescent laterally near the tip (H)
- H. Leaflets glabrous to glabrate above, oblanceolate, 6-10 mm wide; moist habitats, forest floors or clearings of ne Wash. to Mont. and B.C.
- HH. Leaflets pubescent above, sometimes sparsely, linear-elliptic to oblanceolate, generally less than 6 mm wide; Snake River, lower Columbia River and montane western Wash., adjacent B.C.
- J. Banner pubescent over most of the surface of the back, if reduced to a patch under the upper lip of the calyx or glabrous, then the flowers sulphur yellow (K)
- JJ. Banner glabrous on the back or at most a few cilia on the dorsal crest near the tip, or a small patch of pubescence on the dorsal side of the sulcus beneath the tips of the upper calyx lip; flowers normally blue or purple, yellow in *L. arboreus* (O)
- K. Flowers pale sulphur yellow; banner reflexed above the midpoint, the apical notch between the wings and the banner very small; appressed pubescent, spreading in one variety
- KK. Flowers blue (L)
- L. Banner reflexed above the midpoint, the apical notch between the wings and the banner very small; stem spreading to retrorse pubescent
- LL. Banner reflexed at the midpoint, the apical notch between the wings and the banner quite wide (M)
- M. Stems retrorse to spreading pubescent or hirsute
- MM. Stems with the hairs ascending to appressed (N)
- N. Flowers 11-15 mm long, in a dense showy raceme; generally only a few secondary branches
- NN. Flowers 9-11 mm long, in more sparsely spaced, somewhat lax racemes; more branched, sometimes abundantly
- O. Leaflets sericeous above, generally amply pubescent, occasionally glabrous above in *L. littoralis*, then maritime with the stems decumbent to prostrate (P)
- OO. Leaflets generally glabrous above, occasionally sparsely puberulent to sparsely strigose above (V)
- P. Plants forming a tuft; foliage less than 10 cm tall; peduncles exceeding the foliage; racemes subcapitate to densely verticillate, to 6 cm in fruit; banner 8 mm long, obovate-oval; near timberline
6. **caudatus**
- 7b. **arbustus**
subsp. **pseudoparviflorus**
- 7a. **arbustus**
subsp. **neolaxiflorus**
8. **sulphureus**
10. **leucophyllus**
- 11c. **sericeus**
var. **egglesonianus**
- 11a. **sericeus** var. **sericeus**
- 11b. **sericeus** var. **flexuosus**
15. **lyallii**

- PP. Plants tufted or matted; generally the foliage over 10 cm tall, if less than 10 cm tall then the flowers with an orbicular banner over 10 mm long; at lower elevations (Q)
- Q. Tufted, the foliage commonly 10 cm or less in height, only 1 to 3 cauline leaves; banner orbicular; lower elevations in arid transition zone east of the Cascades in the Columbia River drainage 16. **minimus**
- QQ. Tufted or matted, the foliage more than 10 cm from the base and commonly with 4 to numerous cauline leaves (R)
- R. Plants prostrate to decumbent; banner orbicular; maritime, n Calif., Ore., Wash. and Queen Charlotte Islands, British Columbia 23. **littoralis**
- RR. Plants erect; banner elliptic to oblong-elliptic or obovate (S)
- S. Banner elliptic to oblong-elliptic, glabrous; finely sericeous; mostly lower elevations of w Wash. and into adjacent B.C. 14. **lepidus**
- SS. Banner obovate, glabrous; plants densely pubescent (T)
- T. Umbo of keel exposed below the wings; banner tip obtusely pointed; plants with spreading or ascending hispid hairs; Vancouver Island only, introduced 12. **formosus**
- TT. Umbo of keel covered by the wings; banner tip rounded (U)
- U. Keel glabrous or only a few cilia toward the acumen; nw B.C. and Yukon 13. **kuschei**
- UU. Keel ciliate along much of the upper edge, mostly toward the acumen; se B.C. and adjacent Alberta 17. **wyethii**
- V. Keel densely ciliate above near the claws as well as along most of the upper edge; all petioles short, generally less than twice the length of the leaflets, longer on the lower leaves of *L. arcticus* subsp. *canadensis* (W)
- VV. Keel ciliate toward the acumen or glabrous; petiole length various; foliage various (b)
- W. All petioles about the same length as the leaflets, along well-branched stems, with numerous nodes and axillary clusters of leaves; stems slender; plants subshrubby or decumbent (X)
- WW. Petioles 1½ to twice as long as the leaflets, the longer lower down in *L. arcticus* subsp. *canadensis*; stems generally hollow, often fistulose; leaflets occasionally sparsely pubescent above (Y)
- X. Plants glabrous in appearance, actually minutely puberulent except the glabrous upper leaf surface; commonly decumbent; flowers blue; lowlands areas of w Ore., w Wash., n to B.C. 22. **rivularis**
- XX. Plants silvery sericeous except the glabrous upper leaf surface; flowers yellow; hybridizes with the last and others, the blue and thin leaflets often pubescent above; introduced on Vancouver Island 21. **arboreus**
- Y. Pubescence spreading, long shaggy-lanate; bracts

- long and filamentous; stems generally fistulose; lower lip of calyx broad, boat-shaped
- YY. Pubescence appressed or hispidulose with scattered longer hairs ascending; bracts lance-subulate; stems hollow, fistulose or not (Z)
- Z. Stems fistulose or not, commonly more slender than the species; lower calyx lip broad, boat-shaped; maritime B.C. and Alaska
- ZZ. Stems hollow, slender or rarely fistulose; lower calyx lip slender lanceolate (a)
- a. Leaflets strigose to hispidulose above; petioles gradated, longest at the base; primary racemes often 15-25 cm long; flowers scattered to subverticillate; stems rarely fistulose, hispidulose; primarily lowland Vancouver Island and B.C. mainland
- aa. Leaflets generally glabrous above, occasionally strigose; petioles cauline, 4-8 cm long; racemes generally with 4-6 verticils; stems hollow, not fistulose, sericeous, high montane, commonly timberline or snow margin; Wash. n to Alaska
- b. Slender stems from underground rhizomes; e U.S. and Canada (c)
- bb. Stems solitary or clumped, not rhizomatous, sometimes fistulose; western natives (d)
- c. Stems with only fine appressed puberulent hairs; rare in Canada
- cc. Stems with abundant spreading pilose hairs; the common variety in Canada
- d. Stems fistulose with elongated basal petioles 1.5-6 dm long; stems often 5-15 dm tall; racemes elongated, often over 3 dm long (e)
- dd. Stems slender, solid or hollow; leaves mostly cauline except in *L. arcticus* (g)
- e. Bracts subpersistent; flowers small, about 10 mm long or less; pedicels 1-3 mm long; keel ciliate; montane Wyo. to B.C.
- ee. Bracts caducous; flowers 12-16 mm long; leaflets 10-17; keel normally glabrous; moist meadows or streambanks (f)
- f. Stems appressed puberulent; leaflets glabrous above
- ff. Stems hirsute to hispid; leaflets strigose above
- g. Flowers 14-20 mm long; banner reflexed at the midpoint, glabrous; keel glabrous or ciliate (h)
- gg. Flowers 6-12 mm long; banner reflexed above the midpoint, commonly with a small patch of fine pubescence under the tip of the upper lip of the calyx; leaves mostly cauline and numerous (j)
- h. Most of the leaves radicle, 2-4 cauline; longest petioles 9-15 cm long, radicle; arctic slopes to n B.C.
- hh. Leaves mostly cauline; longest petioles 4-8 cm long, cauline; montane n Ore., Wash., and B.C. to Alaska
- 26a. **nootkatensis**
var. **nootkatensis**
- 26b. **nootkatensis**
var. **fruticosus**
- 25c. **arcticus**
subsp. **canadensis**
- 25b. **arcticus**
subsp. **subalpinus**
- 24a. **perennis** var. **perennis**
- 24b. **perennis**
var. **occidentalis**
28. **burkei**
- 27a. **polyphyllus**
var. **polyphyllus**
- 27b. **polyphyllus**
var. **pallidipes**
- 25a. **arcticus** subsp. **arcticus**
- 25b. **arcticus** subsp. **subalpinus**

- j. Flowers very small, 6-7 mm long; keel ciliate; leaflets oblanceolate, often broadly so, glabrous above; petioles commonly shorter than the leaflets 18. **parviflorus**
- jj. Flowers 8-12 mm long; keel ciliate or glabrous; leaflets generally linear to narrowly elliptic-oblanceolate, glabrous or pubescent above (k)
- k. Leaflets sparsely puberulent above; lower leaves sometimes with petioles to 8 cm long; mainly of the Rocky Mts of Wyo. and Mont. but introgressants more widespread 19. **× alpestris**
- kk. Leaflets glabrous above, linear, sericeous below; leaflets about the same length as the petioles, 2-4 cm long or elongated and then the keel glabrous (l)
- l. Flowers 10-12 mm long; wings 4.5-6 mm wide; orbicular in outline viewed laterally 20a. **argenteus** var. **argenteus**
- ll. Flowers 8-10 mm long; wings 4.5 mm wide or less; narrowed as viewed laterally (m)
- m. Upper lip of the calyx gibbous to slightly spurred, 0.5 mm long; keel ciliate near acumen; petioles all 2-4 cm long 20b. **argenteus** var. **tenellus**
- mm. Upper calyx lip not gibbous; keel glabrous; lower petioles to 12 cm long; Vancouver Island only, probably introduced 9. **oreganus**

1. **Lupinus pusillus** Pursh, Fl. Am. Sept. 2: 468. 1814. (Type: see discussion)

Figures 2 to 4

Common Name: Rusty Lupine, Small Lupine.

Plants annual, 8-20 cm tall, simple or diffusely branched from the lower nodes; cotyledons sessile, connate-perfoliate; stems distinctly present, the internodes 1-2 cm long, except the first internode of each branch, which is 2-5 cm long at maturity, densely pilose to hirsute, the hairs 2-3.5 mm long, commonly flat and twisted; mature petioles 2-5.5 cm long, similarly pubescent; lower stipules 6-8 cm long, connate to the petiole 5-6 mm; leaflets 6-8, glabrous above, marginal hairs sometimes folding inward on drying, the largest leaflets 1.5-3.5 cm long, 4-8 mm wide, oblanceolate, the tips obtuse; peduncles 1-2 cm long; racemes 3-5 cm long, exceeding the foliage, lax, the flowers scattered; bracts persistent, subulate, 2-4 mm long, pilose; pedicels 1-2 mm long at anthesis and 2.5-3.5 mm long at fruiting, thinly pilose; calyx thinly pilose to hirsute on the outer surface; corolla glabrous; banner obovate to suborbicular, reflexed near the midpoint, pale blue to white, cream, lavender or pink, 8.6-10 mm long, 7-8.8 mm wide; wings 8.6-10.4 mm long, 3.5-5 mm wide; keel glabrous, lavender near the acumen; pods 14-18 mm long, 6-7 mm wide at the position of the seeds, torulose, sparsely to abundantly hirsute to pilose, the hairs often flat and twisted; the seeds two, white, cream or pastel green with flattened rugose sides and a raised marginal ridge or rim, so the sides concave.

Lupinus pusillus is divisible into three subspecies of which only subsp. *pusillus* extends into Canada. This subspecies extends from northern New Mexico through Colorado, Wyoming and Montana and the western portions of the states



PLANTS OF ALBERTA, CANADA

Lupinus pusillus Pursh

Top:
92

92
...

92
...

DIVISION OF BOTANY, SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

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Figure 2. *Lupinus pusillus* Pursh

immediately to the east of these, into southeastern Alberta and south-central Saskatchewan (Figure 4). In Canada it flowers from late May until mid-July, fruits in late July and throughout August. It prefers sandy soils. *L. pusillus* subsp. *rubens* (Rydb.) Dunn occurs in Arizona, western Colorado, Utah and southern Nevada; subsp. *intermontanus* (Heller) Dunn is confined chiefly to the far western states of Washington, eastern Oregon, eastern California, Idaho, Nevada, Utah and western Wyoming.

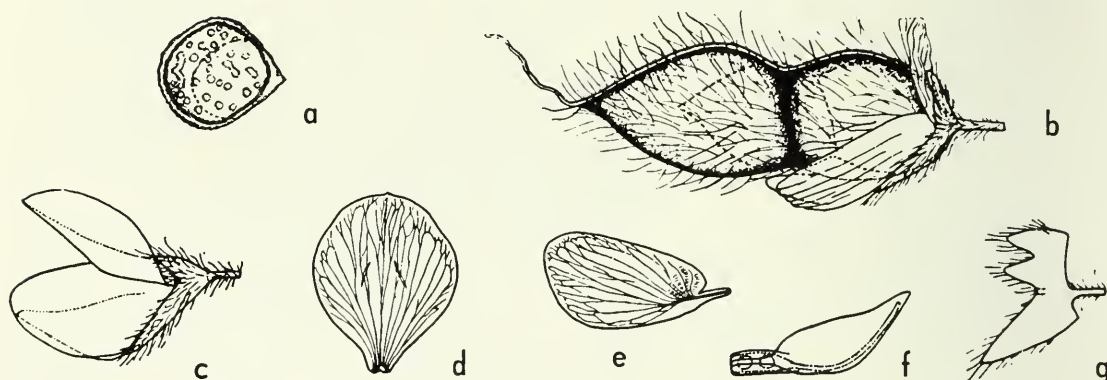


Figure 3. *Lupinus pusillus* Pursh (a) seed; (b) pod; (c) flower; (d) banner; (e) wing; (f) keel; (g) calyx, inner view

The original description by Pursh was made from a specimen collected by Merriweather Lewis on the banks of the Missouri. There is a specimen at the British Museum inscribed by Pursh for the *Flora Americana* with the plant name but there is no indication whether it is a Lewis collection or not. This specimen is probably an isotype but could be a paratype.

Both a specimen collected by Nuttall on the banks of the Missouri, supposedly near the White River, as noted by Heller (1909), and a specimen from near the White River on the upper Missouri River collected by Geyer in 1839 were seen.

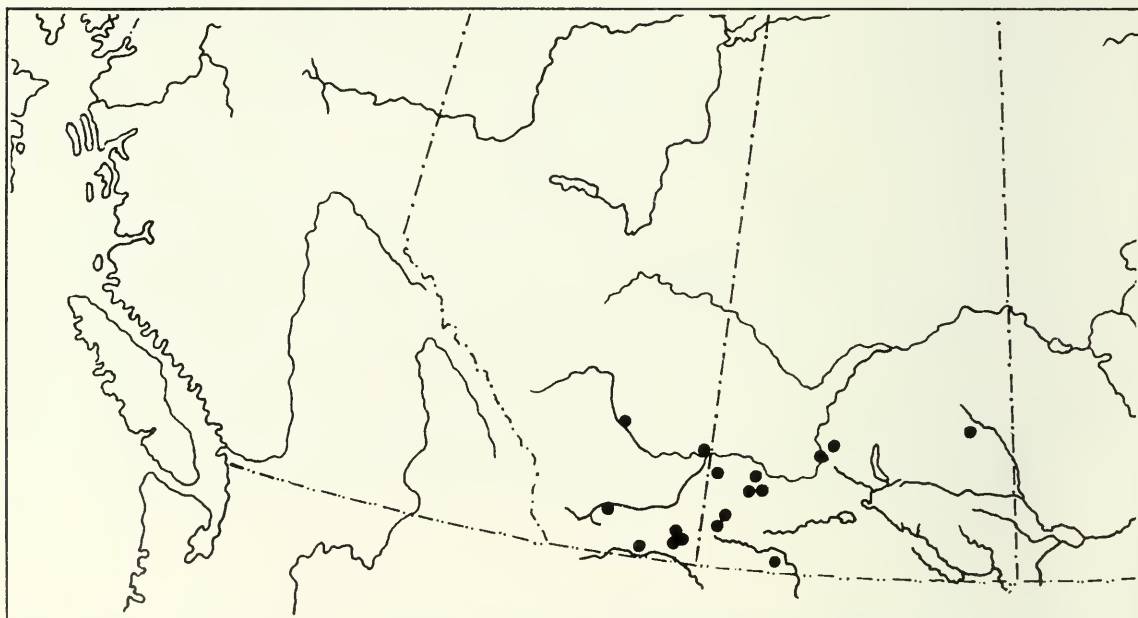


Figure 4. Distribution of *Lupinus pusillus* Pursh in Canada

All of the Missouri River drainage is within the distribution of the material interpreted as being *L. pusillus* subsp. *pusillus*, so it is hardly possible that material of one of the other two subspecies could have been used in the original description. Douglas's specimen in the Lindley Herbarium, which was used by Hooker (1832) and Agardh (1835) to describe *L. pusillus*, was seen also, and is material of the subsp. *intermontanus*, which has been so annotated. Torrey and Gray (1840) used specimens of Lewis and Nuttall for their description.

2. ***Lupinus densiflorus* Benth. var. *scopulorum* C. P. Smith, Bull. Torrey Club 45: 201. 1918. (Type: Beacon Hill, Victoria, B.C., *Macoun 21* US)**

Figures 5 and 6

L. microcarpus Sims var. *scopulorum* C. P. Smith, Bull. Torrey Club 51: 100. 1924.

Common Name: Dense-flowered Lupine.

Plants annual, 2-3 dm tall; cotyledons sessile, connate-perfoliate, fleshy; stems hollow, 5-7 mm in diameter, often fistulose, abundantly spreading to retrorse pilose, the hairs 2-3.5 mm long, the first internode on the branches 7-12 cm long, followed by 4-5 nodes close together, the branches appearing to have a tuft of leaves at the top, which supports the inflorescence; petioles of primary leaves 7-14 cm long, first in a basal rosette, later clustered at branch tops, pubescence as on the stems; stipules 2.5-3.0 cm long, the connate portion 10-15 mm, membranaceous, the free tip subulate to filiform, leaflets of primary leaves 8-10, elliptic-oblongate, glabrous above, spreading-pilose below, the largest 22-32 mm long, 5-7.5 mm wide, acute to obtuse; peduncles 10-15 cm long on primary stem, 5-7 cm long on branches; bracts persistent, subulate-attenuate, 15 mm in bud but curling on drying; racemes of 5-7 verticils on primary stem, branches 2-5 verticils, 15-20 mm distant, often secund in age; flowers white to yellowish white, often with a shade of pink, all parts slender and persistent as dried membranes at fruiting; calyx hirsute without, ebracteolate, the upper lip 2-4 mm long, two-lobed with membranaceous rounded tips, the lower lip rostrate, 10-11 mm long, tridentate; banner oblong, 12-14 mm long, 6-7 mm wide, sulcus hispidulose within; wings narrowly oblong 13-15 mm long, 4.5-6 mm wide, sparsely ciliate below the claws and densely ciliate at the angle above the claws; legume rhomboid, hirsute, 15-18 mm long, 9-10 mm wide, style persistent, coiled; ovules 2, dark brown, 5-6 mm long, 4-4.5 mm wide, the sides convex, thickest in the center.

Lupinus densiflorus occurs around Victoria, Vancouver Island, British Columbia. Material has been seen from Beacon Hill Park (the type locality), Dallas Road and Clover Point (UBC, V). The Canadian material is so uniform that it could represent an introduction of seed from a single source. The colony is maintained by subsequent obligate self-pollination of the plants. It is also found in the Puget Sound area of Washington. The geographical hiatus between these stands and the main population in the southern half of California is good evidence that it has been introduced. Ultimately monographic studies will possibly prove relationship of this northern population to the maze of varieties Smith named for California.

For several reasons the taxon cannot be *L. microcarpus* Sims as later suggested by Smith. *L. microcarpus* was named from material grown in England from seed believed to have come from Chile. It was originally described as pod torulose and the flowers blue, traits which are not present in either *L. densiflorus* or the segregate species *L. subvexus* C. P. Smith. In the description no mention was made of any ciliation on the keel, a character that was commonly overlooked by



No. 78, 896

Herb. Geological Survey of Canada.

PLANTS OF VANCOUVER ISLAND.

Lupinus micranthus, Sims
Vicinity of Victoria.

Collector, J. H. Macoun Beacon Hill, June 15th 1908

Lupinus densiflorus Benth.
var. *scopulorum* C. P. Smith
Annotated by: E. B. D. Date: 1965

Figure 5. *Lupinus densiflorus* Benth. var. *scopulorum* C. P. Smith

earlier authors. At the present time, the flower conformation and two-seeded pod indicate that *L. microcarpus* is a Southern Hemisphere relative of the *L. densiflorus* complex.

In British Columbia, *L. densiflorus* flowers from June until October but the Californian population flowers in April and May. The flowers become secund in age, a trait peculiar to *L. densiflorus*.

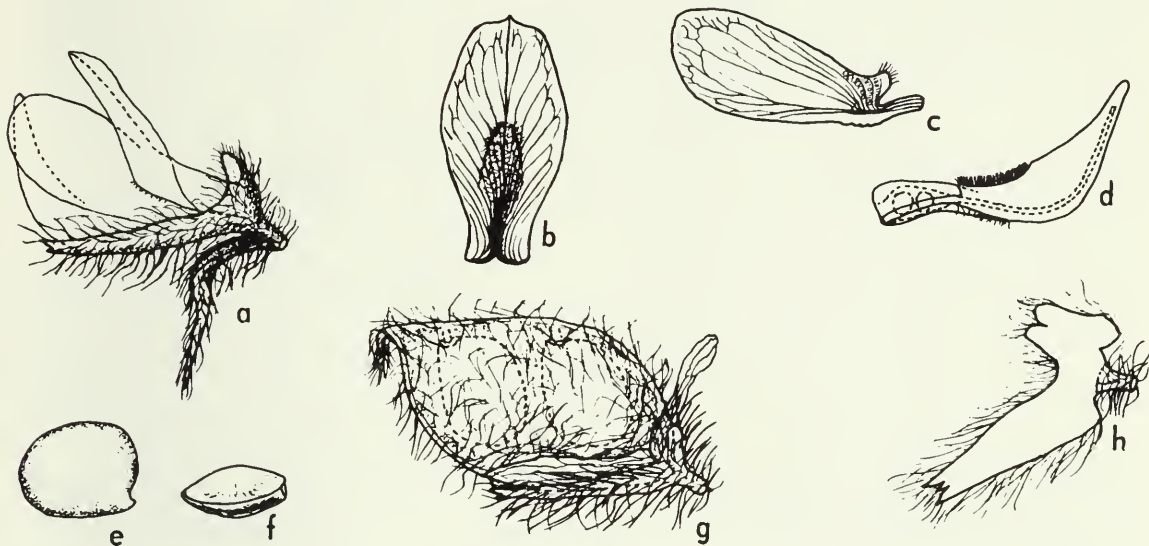


Figure 6. *Lupinus densiflorus* Benth. var. *scopulorum* C. P. Smith (a) flower; (b) banner; (c) wing; (d) keel; (e) seed; (f) seed, edgewise; (g) pod; (h) calyx

3. ***Lupinus polycarpus* Greene**, Pittonia 1: 171, 1888. (Type: Collected by Greene near San Francisco, California, ND)

Figures 7 to 9

L. micranthus Dougl. in Lindl., Bot. Reg. 15: t. 1251. 1829, *non* Guss. 1828. (Type: "upon the gravelly banks of the southern tributaries of the Columbia and the barren ground of the interior of California," Douglas, CGE)

Common Name: Small-flowered Lupine.

Erect to suberect annuals 1.5-4.5 dm tall, branched mostly at the base, sparsely appressed-pubescent, longer hairs absent or essentially so; leaflets 5-7, the largest 1.3-4.0 cm long, 2.4-4.8 mm wide, linear-oblong to narrowly elliptic or oblanceolate, the upper surfaces generally quite glabrous and green; longest petioles 4.0-9.6 cm long; stipules 6.2-17 mm long, adnate to the petioles for 2.4-6.5 mm; peduncles 2.5-10.5 cm long; racemes 1.0-7.5 cm long; verticils 2-7 or more, either clearly whorled or indistinct, 5-11 mm distant at anthesis, as much as 2.0 cm at maturity; bracts 3.2-5.6 mm long, fugacious; pedicels 1.0-2.2 mm long at anthesis; calyx pubescent with hairs 0.2-0.7 mm long, the lips connate 1-1.6 mm, the lower 3.2-4.4 mm long, straight, entire or the teeth to 0.3 mm long, the lobes of the upper lip 2.5-4.0 mm long, united 1.3-2.0 mm, the bracteoles 0.1-0.7 mm long; banner heart-shaped, 5.1-7.4 mm long, 4.0-5.2 mm wide (l/w ratio 1.2-1.5), the reflexed part 1.7-2.7 mm long, the appressed part 3.2-4.2 mm long (l/w ratio 0.48-0.66), the angle 120°-150°; wings 4.9-6.8 mm long, 1.9-3.4 mm wide; keel ciliate on the upper margin of the distal half, sometimes almost glabrous, 1.1-1.6 mm wide at the middle, the upper limb 2.2-3.4 mm long, the lower 3.4-4.4 mm long, the angle 90°-120°; pods 9.7-3.4 cm long, 4.7-6.5 mm wide, pubescent with

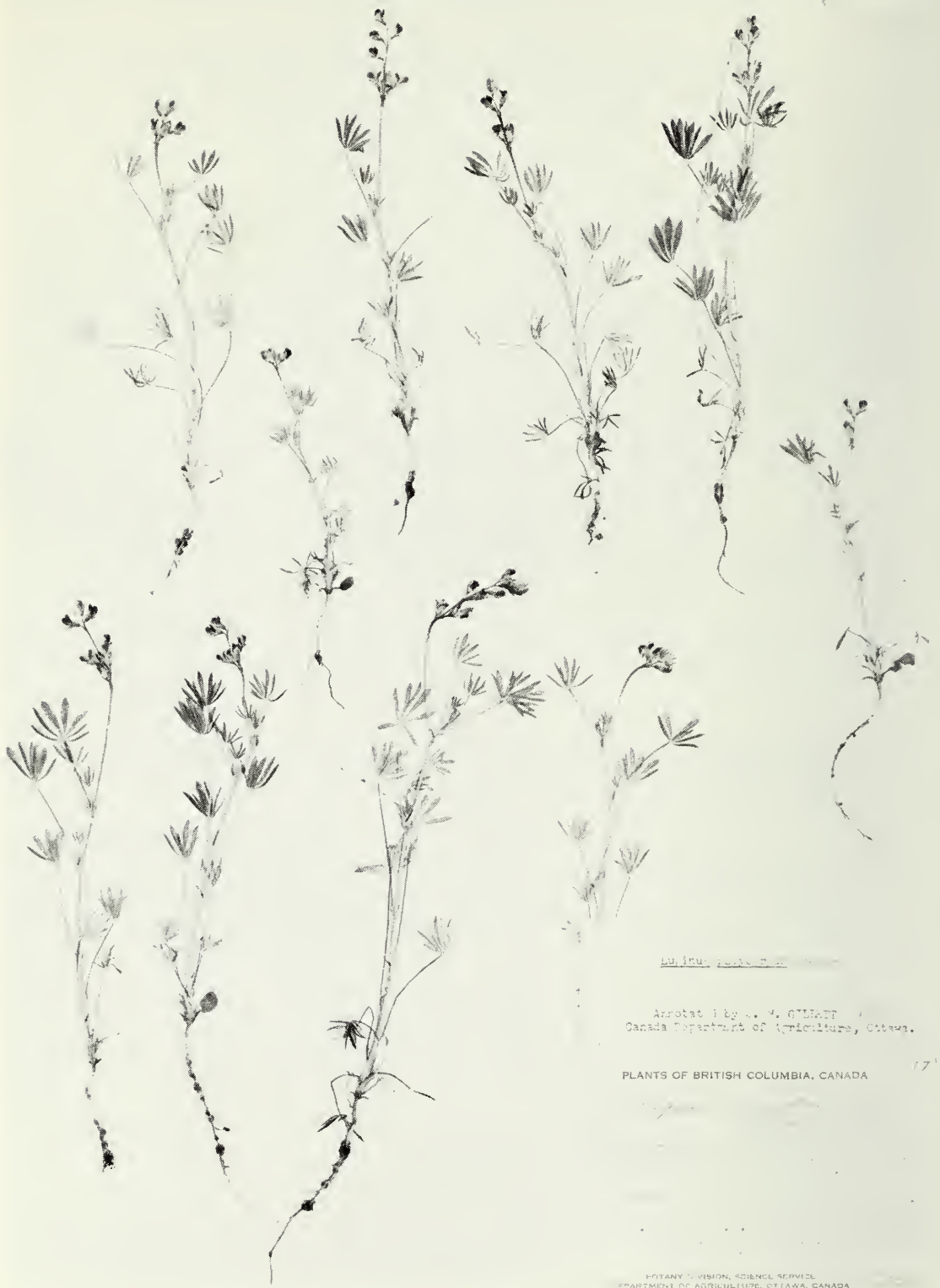


Figure 7. *Lupinus polycarpus* Greene

subappressed hairs or glabrate; ovules 4-8, 2.8-3.5 mm long, 2.0-2.8 mm wide, dark gray to brown, usually abundantly stippled and mottled with black or brown, the angle mark wanting.

This species is one of the most widespread in a north-south direction of any of the annual lupines. While there are morphological variations within the range, none were considered to be worthy of recognition. It ranges from Los Angeles, California, northward to British Columbia in the interior valleys of the coastal ranges and eastward into the Sierra Nevada mountains and in sparse grassland of eastern Oregon and Washington. Flowering is from April to June.

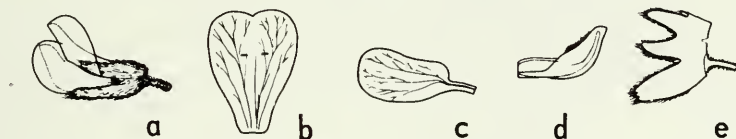


Figure 8. *Lupinus polycarpus* Greene (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

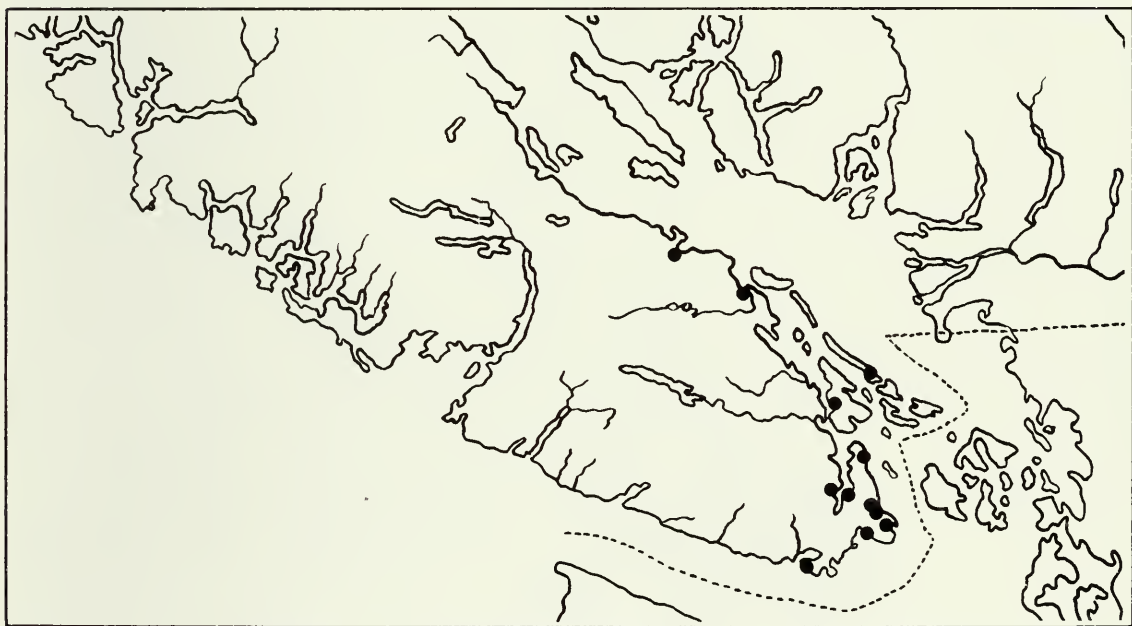


Figure 9. Distribution of *Lupinus polycarpus* Greene in British Columbia

4. ***Lupinus bicolor*** Lindl., Bot. Reg. 13: t. 1109. 1827. (Type: a garden plant grown from seed collected by Douglas "in the interior of the country about the Columbia River, from Fort Vancouver to the branches of the Lewis and Clark's River," CGE)

Figures 10 to 12

L. micranthus Dougl. var. *bicolor* (Lindl.) S. Wats., Proc. Am. Acad. 8: 536. 1873.

L. hirsutulus Greene, Leaflet Bot. Obs. & Crit. 2: 152. 1911. (Type: Beacon Hill, Vancouver Island, British Columbia, 15 June 1908, Macoun CAN, isotype ND)

Common Name: Bicolored Lupine.

Erect or suberect annuals 4-35 cm tall, the longest branches mostly basal; pubescence appressed, or spreading and ascending, with few to many longer spreading hairs 1.0-1.5 mm long; leaflets 6-7, the largest 13-35 mm long, 1.7-5.0 mm wide, linear-oblongate, acute or obtuse, both surfaces appressed-pubescent;



PLANTS OF BRITISH COLUMBIA, CANADA

BRITISH COLUMBIA, CANADA
VANCOUVER ISLAND
JULY 1951
J. H. W. & J. H. W.
J. H. W. & J. H. W.

BOTANY AND PLANT PATHOLOGY DIVISION, SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

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BRITISH COLUMBIA, CANADA
VANCOUVER ISLAND

BRITISH COLUMBIA, CANADA
VANCOUVER ISLAND
JULY 1951
J. H. W. & J. H. W.
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DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

110-63-17687 (PIM-281)

Figure 10. *Lupinus bicolor* Lindl.



Figure 11. *Lupinus bicolor* Lindl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

longest petioles 3.0-6.3 cm long; stipules 6.0-12.5 mm long, connate to the petioles for 1.4-5.4 mm; peduncles 2.5-8.7 cm long; racemes 0.3-7.0 cm long; verticils 1-5, generally 2 distinct or indistinct, 0.3-1.7 cm distant, or as much as 2.7 cm at maturity; bracts 3.8-6.0 cm long, fugacious; pedicels 1.7-3.4 mm long, evenly ascendant-pubescent; calyx silky, subappressed-pubescent, the lips connate 0.9-1.4 mm, the lower 4.0-5.1 mm long, straight, tridentate, the teeth occasionally as much as 0.4 mm, the lobes of the upper lip 3.1-4.2 mm long, united 1.1-1.8 mm, the bracteoles wanting, or as long as 0.8 mm; banner oblong, truncate, but sometimes mucronate, 6.0-8.9 mm long, 3.1-5.8 mm wide (l/w ratio 1.2-1.8), much reflexed from the wing tip, the reflexed part 3.4-4.7 mm long, the appressed part 3.0-3.8 mm long (l/w ratio 1.03-1.38), angle 115° - 140° ; wings 6.2-9.1 mm long, 3.1-4.6 mm wide, oblong or oval, fused only a short distance; keel ciliate on the distal half; 1.5-2.3 mm wide at the middle, the angle 102° - 135° (av. 112°), the upper limb 4.4 mm long, the lower 4.7 mm long; largest pods 1.9-2.5 cm long, 4.0-5.4 mm wide, covered with subappressed hairs 0.8-1.2 mm long; seeds 4-8, 2.3-3.3 mm long, 1.7-2.4 mm wide, light gray to tan with varying amounts of black stippling, a black angle line present in most colonies.

Occurring in sandy or well-drained soils in a coastal or near-coastal zone from Del Norte and Humboldt counties, California, northward to Vancouver Island and the Fraser River Valley, B.C. Flowering from May to July depending upon the latitude.

L. hirsutulus has been referred by C. P. Smith to *L. nanus* Dougl. var. *apricus* (Greene) C. P. Smith. However, the shape of the banner and the pedicel length suggest that it should be considered a synonym of *L. bicolor*.

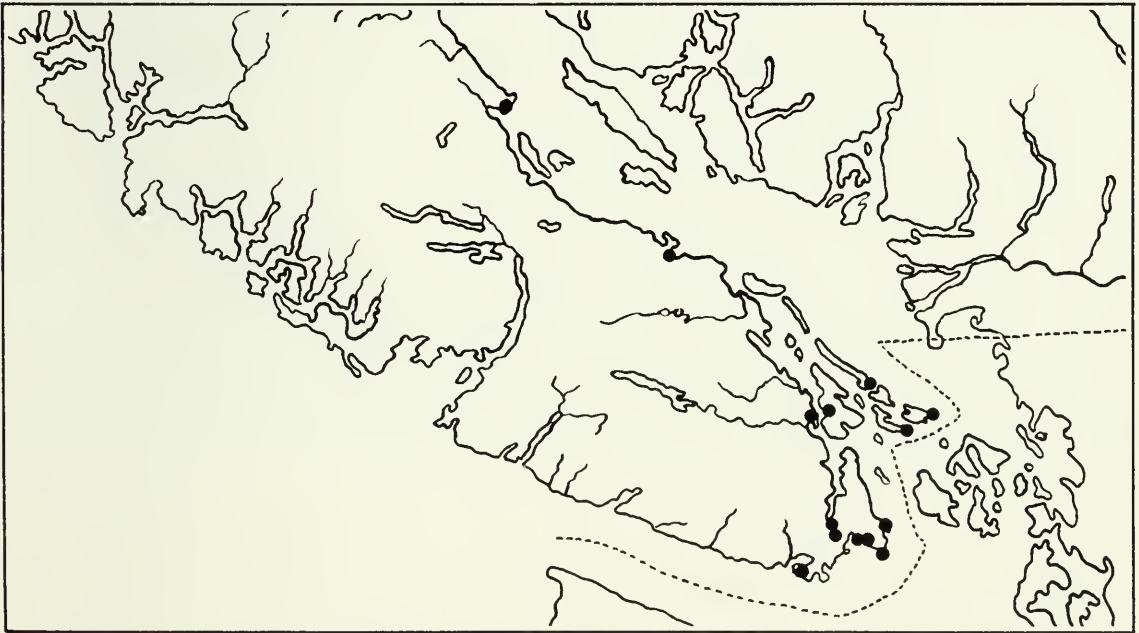


Figure 12. Distribution of *Lupinus bicolor* Lindl. in British Columbia



HERBARIUM, UNIVERSITY OF CALIFORNIA
DEPARTMENT OF BOTANY, DAVIS, CALIFORNIA

Lupinus vallicola Heller
subsp. *apricus* (Greene) Dunn
(Lup. det.)

Abundant in open, low brush: south side
of State Highway 12, 2 1/2 miles south-
west of Winters, Yolo County, California.

C. L. Dickey 2379
Jan. 1950. J. L. Dickey

Figure 13. *Lupinus vallicola* Heller subsp. *apricus* (Greene) Dunn

5. ***Lupinus vallicola* Heller subsp. *apricus* (Greene) Dunn, El Aliso 3: 166. 1955.**

Figures 13 to 15

L. apricus Greene, Leaflet Bot. Obs. & Crit. 2: 67. 1910. (Type: near Stanford University, California, Baker 610, isotype CAS)

L. vallicola Heller var. *apricus* (Greene) C. P. Smith, Muhlenbergia 6: 135. 1911.

L. nanus Dougl. var. *apricus* (Greene) C. P. Smith, Bull. Torrey Club 50: 170. 1923.

Common Name: Open Lupine.

Erect or suberect annuals 15-40 cm tall, branching mostly at the base, minutely appressed-pubescent, with numerous longer spreading hairs; leaflets 6-8, the largest 1.0-4.0 cm long, 1.4-5.0 mm wide, oblanceolate to linear-oblanceolate, both surfaces pubescent; longest petioles 2.5-7.5 cm long; stipules 5.0-12.0 mm

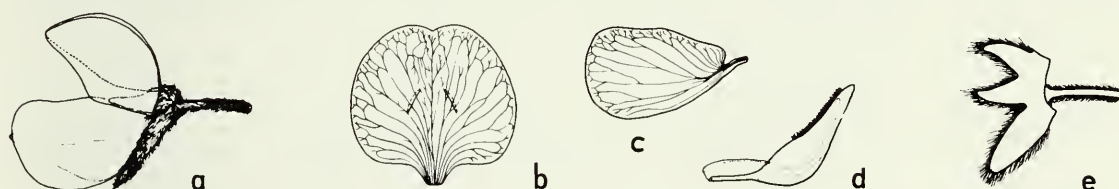


Figure 14. *Lupinus vallicola* Heller subsp. *apricus* (Greene) Dunn (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

long, adnate to the petioles for 2.0-5.0 mm; peduncles 1.5-9.5 cm long; racemes 1.0-12.5 cm long; verticils 1-9, frequently indistinct, 12-23 mm distant at anthesis; bracts 3.6-5.4 mm long; pedicels 2.5-5.4 mm long; calyx pubescent with hairs 0.2-0.5 mm long, the lips connate 0.8-1.4 mm, the lower 4.0-5.5 mm long, the lobes of the upper 2.8-4.4 mm long, united 1.2-1.8 mm, the bracteoles 0.2-1.4 mm long; banner nearly orbicular, 7.0-10.0 mm long, 6.5-10.8 mm wide (l/w ratio 0.8-1.25), the angle 115°-150°; wings 7.5-10.0 mm long, 3.7-5.6 mm wide; keel ciliate on the distal half, 1.5-2.5 mm wide at the middle, the upper limb 4.5-6.0 mm long, the

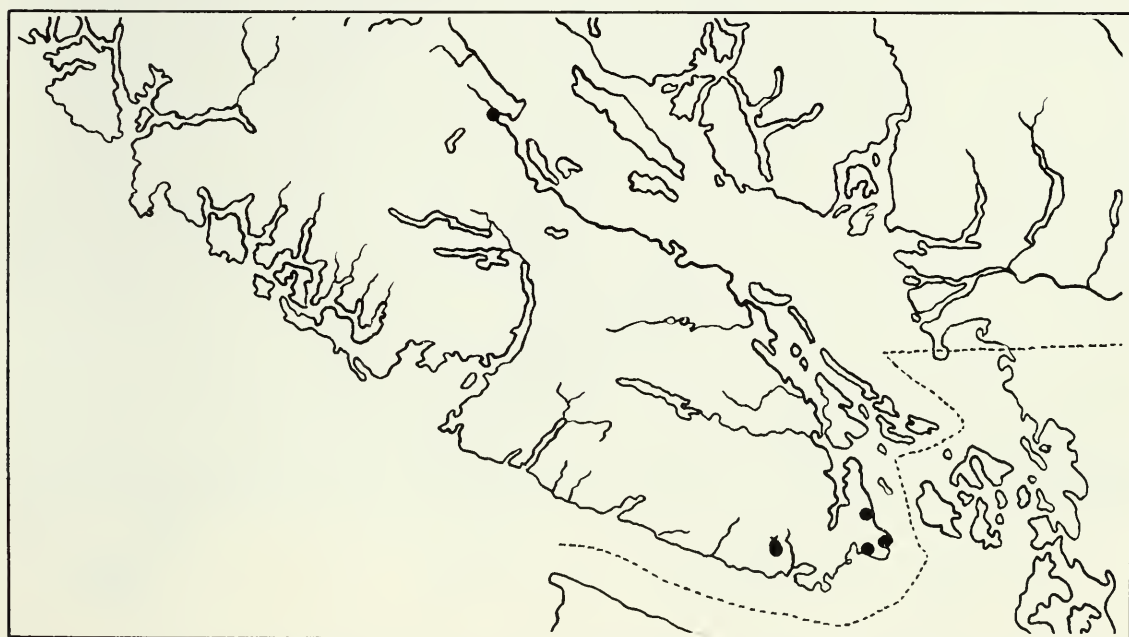


Figure 15. Distribution of *Lupinus vallicola* Heller subsp. *apricus* (Greene) Dunn in British Columbia



Figure 16. *Lupinus caudatus* Kell.

lower 4.5-6.1 mm long, the angle 75°-100°; pods 1.7-2.7 cm long, 4.4-5.4 mm wide, pubescent with subappressed hairs 0.2-0.6 mm long; seeds 4-8, variously mottled.

Open pastures and fields; flowering in May and June.

L. vallicola subsp. *apricus* is morphologically intermediate between subsp. *vallicola* and *L. bicolor* of California (Dunn, 1956). In fertility studies, subsp. *vallicola* was found to require insect aid for pollination as in *L. nanus* Dougl. It was essentially sterile with *L. nanus* but fertile in crosses with several subspecies of *L. bicolor*. All but one of the *L. bicolor* subspecies tested were nearly obligate self-pollinated.

6. ***Lupinus caudatus* Kell., Proc. Calif. Acad. 2: 197. f. 61. 1862. (Type: Carson Valley, Kellogg, CAS-62286)**

Figures 16 and 17

L. meionanthus A. Gray var. *heteranthus* S. Wats., Bot. King's Rep. 56. 1871. (Type: Carson City, Nevada, Anderson 232, isotype UC)

L. holosericeus A. Gray var. *utahensis* S. Wats., Proc. Am. Acad. 8: 533. 1873. (Type: Mts. of n Utah, Watson 232, GH)

L. argentinus Rydb., Bull. Torrey Club 30: 257. 1903. (Type: near Reno (prob. Nevada) Stokes, 19 June 1900, NY)

L. rosei Eastw., Leaflet West. Bot. 2: 22. 1941. (Type: Mono Lake, Mono Co., Calif., Rose 37701, CAS)

L. stinchfieldiae C. P. Smith, Sp. Lup. 509. 1945. (Type: Bishop Cr. above N. Lake, Inyo Co., Calif., Ferris 8963, DS, POM)

L. montis-liberatis C. P. Smith, Sp. Lup. 571. 1946. (Type: Minidoka, Cassia Co., Idaho, Christ 14486, DS)

L. gayophytophilus C. P. Smith, Sp. Lup. 734. 1952. (Type: Range Exp. Sta., Elmore Co., Idaho, Pearse 229, USFS)

L. lupinus Rydb., Bull. Torrey Club 40: 44. 1913, *pro parte*. (Type: W. Bears Ears, Elk Mt., Utah, Rydberg & Garrett 9363, NY, MIN)

L. utahensis Moldenke, Torreyia 34: 9. 1934, new name for *L. lupinus* Rydb.

Common Name: Kellogg's Spurred Lupine.

Plants 3-6 dm tall, the stems in clumps, erect or decumbent; the basal leaves present or absent at flowering time; petioles of the basal leaves 6-10 cm long, the cauline 2-5 cm long; leaflets 7-10, 2-4 or occasionally 6 cm long, 4-8 mm wide, linear-oblongate, acute, often conduplicate, mucronate, evenly densely sericeous on both surfaces; peduncles 2-5 cm long; racemes 4-10 cm long, verticils usually

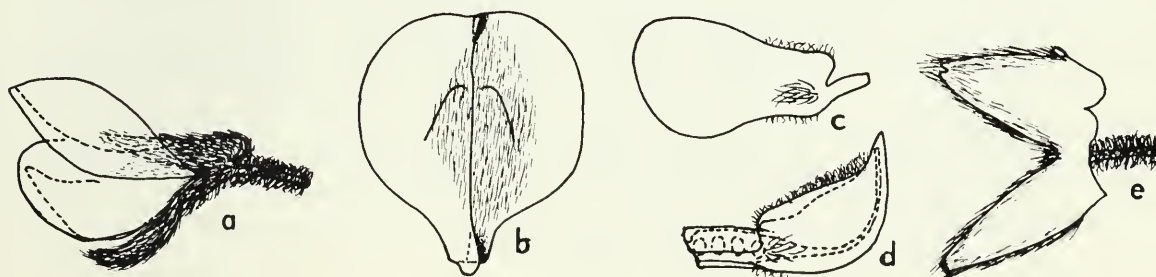


Figure 17. *Lupinus caudatus* Kell (a) flower; (b) spurred banner; (c) pubescent wing; (d) pubescent keel; (e) spurred calyx

only 10-12 mm apart; bracts caducous; pedicels 2-4 mm long; flowers 8-12 mm long; calyx with a spur 0.4-1 mm long above, the upper lip 5.5-9 mm long, the lower 6-11 mm long; banner pubescent on the back and in the ventral groove, reflexed well above the midpoint; wings with lateral villi near the claws and cilia above and below the claws on the margins or glabrous in one or more of the locations mentioned; keel ciliate above and often below the claws, also with lateral villi near the claws; ovules 3-5; pods 25-30 mm long, 8-9 mm wide, densely sericeous. No map.

With sagebrush or pines in the mountainous areas from California northward to Oregon and Idaho and British Columbia, southeastward to Arizona and New Mexico. Flowering in June and July. Possibly introduced into British Columbia.

- 7a. **Lupinus arbustus** Dougl. ex Lindl. subsp. **neolaxiflorus** Dunn, Leaf. West. Bot. 7: 254. 1955. (Type: Vicinity of the Falls of the Columbia River (Celilo Falls, probably in Klickitat County, Washington, but also possibly on the south side of the Columbia River, Wasco County, Oregon, perhaps as much as 20-40 miles inland, Douglas's hiking range), *Douglas* 297, 20 June 1825, CGE)

Figures 19 and 20

- L. inyoensis* Heller var. *demissus* C. P. Smith, Bull. Torrey Club 51: 304. 1924. (Type: Wallowa Mountains, Baker Co., Oregon, *Peck* 5329 WILLU, isotype DS)
- L. caudatus* Kell. var. *submanens* C. P. Smith, Sp. Lup. 106. 1939. (Type: Anatone Creek, 2 mi e Anthony Lake, Wallowa Co., Oregon, *Lyle*, 10 Aug. 1930, DS)
- L. lyleianus* C. P. Smith, Sp. Lup. 107. 1939. (Type: 7 mi e Pearson Ranger Station, Umatilla Nat. Forest, Oregon, *Lyle*, 14 July 1930, DS, an intermediate with *L. caudatus*)
- L. yakimensis* C. P. Smith, Sp. Lup. 238. 1940. (Type: Cleman Mountains, 25 mi nw Yakima, Washington, *Thompson* 14572, WTU)
- L. wenatchensis* Eastw., Leaf. West. Bot. 3: 174. 1942. (Type: Alpine slopes Wenatchee Mountains, *Thompson* 14242, CAS)
- L. henrysmithii* C. P. Smith, Sp. Lup. 566. 1946. (Type: Minidoka Nat. Forest, Idaho, *H. L. Smith* 119, USFS 42539)
- L. amniculi-putorii* C. P. Smith, Sp. Lup. 575. 1946. (Type: Mink Creek, Bannock Co., Idaho, *Crane*, 30 July 1935, DS, an intermediate with *L. caudatus* Kell)
- L. mackeyi* C. P. Smith, Sp. Lup. 725. 1952. (Type: Clifty Block Mountain Range, Kaniksu Nat. Forest, Idaho, *Mackey* 65, USFS 47532)
- L. augusti* C. P. Smith, Sp. Lup. 733. 1952. (Type: Head of Slater Creek, Boise Nat. Forest, Elmore Co., Idaho, *Pearce* 23, USFS 64136, an intermediate with *L. caudatus* Kell.)
- L. stipaphilus* C. P. Smith, Sp. Lup. 733. 1952. (Type: North Star Lake, Boise Nat. Forest, Elmore Co., Idaho, *Pearce* 165b, USFS 67739)
- L. festucasocius* C. P. Smith, Sp. Lup. 738. 1952. (Type: Copper Basin Potholes, Lemhi Nat. Forest, Idaho, *Johnson* 20, USFS 56432, an intermediate with *L. caudatus*)
- L. stockii* C. P. Smith, Sp. Lup. 743. 1952. (Type: Bostetter Ranger Station, Minidoka Nat. Forest, Idaho, *Stock* 186, USFS 33836)
- L. standingi* C. P. Smith, Sp. Lup. 749. 1952. (Type: Deep Creek, near Malad, Cache Nat. Forest, Idaho, *Standing* 18, USFS 44296)

Common Name: Shrubby Lupine.

Plants 2-4 dm tall, the stems clumped from a woody caudex, the upper nodes branching later, finely sericeous throughout, the petioles of the basal leaves 8-13



PLANTS OF BRITISH COLUMBIA, CANADA

BOTANY DIVISION, SCIENTIFIC SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

DR. J. S.
1946-1947, 24

Figure 18. *Lupinus arbustus* Dougl. subsp. *pseudoparviflorus* (Rydb.) Dunn

cm long, slender, present at anthesis; leaflets 8-10, linear-elliptic to linear-oblongate, the largest 2.5-5 cm long, 3.7 mm wide, pubescent on both sides, the tips acute; peduncles 2-8 cm long; racemes 7-12 cm long, lax or dense; bracts subsistent to caducous; verticils 8-20 mm distant; pedicels 3-4 mm long; flowers 8-10 mm long, upper lip of the calyx 3-4.5 mm long with a gibbous base or a short spur 0.2-1.4 mm long at the base, the lip exposed or partially covered by the sides of the banner, with bracteoles 0.2-1 mm long; banner obovate to suborbicular, sparsely pubescent in the dorsal grooves and under the calyx lip, or glabrous in about one fourth of those studied; wings pubescent laterally near the tip in about one third of those seen, more commonly glabrous; keel minutely and sparsely ciliate along the upper edges; ovules 3-5; pods 24-28 mm long, 6-7 mm wide, sericeous.

Included in *L. arbustus* subsp. *neolaxiflorus* is the main population considered by authors since Agardh as *L. laxiflorus*. Its center of distribution is in the mountains of central Washington, extending southward into the northern edge of Oregon and eastward in the Snake River drainage of southern Idaho. It is found in meadows and gravelly valleys and in rolling hills with *Artemisia tridentata* and *Tetradymia* and on up to rocky slopes in the Ponderosa Pine zone. Some specimens appearing to be hybrids with subsp. *pseudoparviflorus* were collected among aspens and lodgepole pines.

The vegetative habit, the small flowers commonly with glabrous wing tips, the slight pubescence on the back of the banner and sparse ciliation on the upper edges of the keel, all suggest a close relationship with *L. lepidus* Dougl. Flowering in June, July and August.

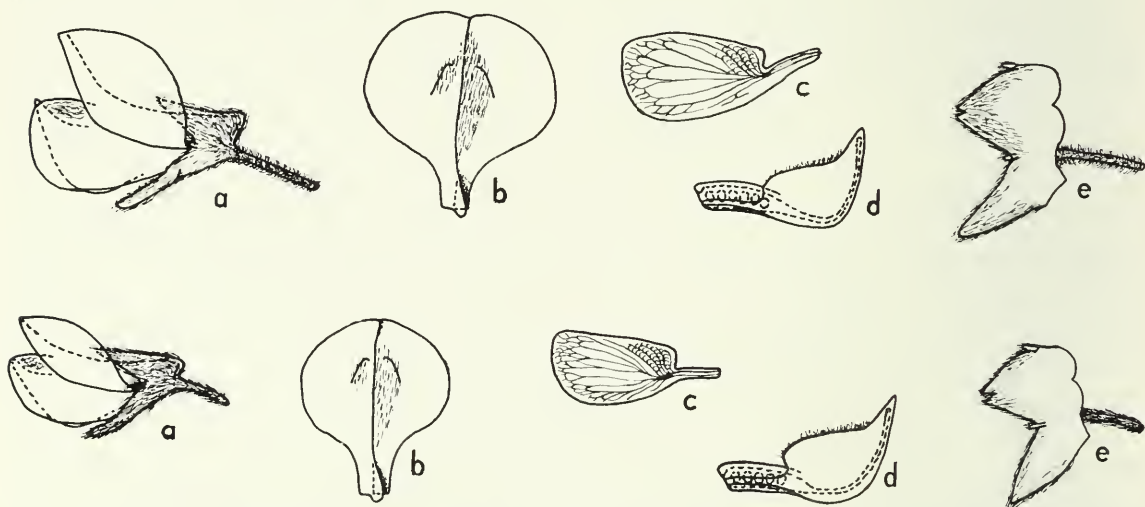


Figure 19. *Lupinus arbustus* Dougl. Upper row, subsp. *pseudoparviflorus* (Rydb.) Dunn (a) flower; (b) banner; (c) wing, showing usually glabrous tip; (d) keel; (e) calyx. Lower row, subsp. *neolaxiflorus* Dunn (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

7b. *Lupinus arbustus* Dougl. ex Lindl. subsp. *pseudoparviflorus* (Rydb.) Dunn, Leaflet. West. Bot. 7: 255. 1955.

Figures 18 to 20

L. pseudoparviflorus Rydb., Mem. N.Y. Bot. Gard. 1: 232. 1900. (Type: Bridger Mountains, Montana, Rydberg & Bessey 4441, NY, MIN, WS)

L. laxiflorus Dougl. in Lindl. var. *pseudoparviflorus* (Rydb.) C. P. Smith in St. John, Fl. SE. Wash. 227. 1937.

- L. laxispicatus* Rydb., Bull. Torrey Club **34**: 42. 1907. (Type: High mountains of Kootenai Co., Idaho, Sandberg in July 1887, NY)
- L. laxiflorus* Dougl. var. *durabilis* C. P. Smith, Jour. Bot. **13**: 529. 1926. (Type: Priest River Range, Bonner Co., Idaho, Leiberg 2731, US)
- L. laxispicatus* Rydb. var. *whithamii* C. P. Smith in St. John, Fl. SE Wash. 227. 1937. (Type: Jct. Divide and King Creek trails, Kaniksu Nat. Forest, Washington, Smith, St. John & Whitham 4170, DS, WS)
- L. sulphureus* Dougl. subsp. *whithamii* (C. P. Smith) Phillips, Res. Stud. St. Coll. Wash. **23**: 193. 1955.
- L. laxiflorus* Dougl. var. *elmerianus* C. P. Smith, Sp. Lup. 106. 1939. (Type: Paradise, Wallowa Co., Oregon, Applegate 6483, DS)
- L. mucronulatus* Howell var. *umatillensis* C. P. Smith, Sp. Lup. 108. 1939. (Type: Table Rock, Umatilla Co., Oregon, Lyle in July, 1930, DS)
- L. fieldianus* C. P. Smith, Sp. Lup. 567. 1946. (Type: Thorn Creek, Idaho Nat. Forest, Idaho, Fields 224, USFS 23418, an intermediate with subsp. *neolaxiflorus* Dunn)
- L. lacus-payetti* C. P. Smith, Sp. Lup. 574. 1946. (Type: Payette Lake, Idaho, Jones 6251, POM, MO, US)

Common Name: Montana Lupine.

Plants 3-6 dm tall, with several simple stems from a woody caudex, these branching later from the upper nodes, the stems 1.5-2.5 mm in diameter, finely, thinly sericeous, with basal leaves generally present at anthesis; petioles of the basal leaves 8.5-15 cm long, those of the upper cauline leaves 2.5-3 cm long, leaflets 7-11, the largest 4-6 (-8) cm long and 6-10 mm wide, the tips rounded, or obtuse to acute in intermediate forms; leaflets commonly glabrous on the upper surface, the intermediate forms sparsely pubescent; peduncles 3-6 cm long; racemes 3-12 cm long, lax or dense, bracts caducous or tardily deciduous; flowers 9.5-13 mm long; pedicels 3-5 mm long, sometimes up to 10 mm long; upper lip of the calyx gibbous or with a spur 0.6-1.4 mm long, the tip usually covered by the sides of the banner; banner finely pubescent in the central area or glabrous in 10-30 percent of the specimens; the wings glabrous in about 30 percent of the specimens, the others pubescent near the tip; the keel ciliate above near the

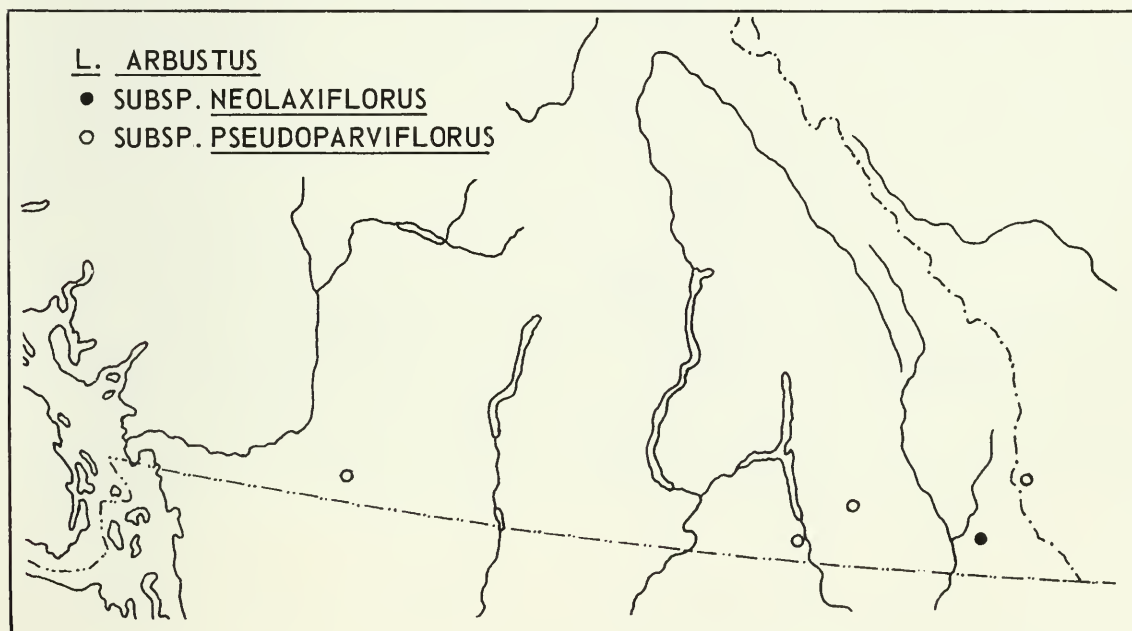


Figure 20. Distribution of *Lupinus arbustus* Dougl. in British Columbia



FLORA OF OREGON

21756 *Lupinus sulphureus* Dougl. ex
Hook. var. *sulphureus*

UMATILLA CO: Grade into Blue Mts. 10 mi.
s.e. of Pendleton, on grassy basaltic
hills; very abundant.

Corolla mostly fairly deep sulphur
yellow, the banner not much reflexed
from the wings; no blue color in any of
the flowers; flowers not at all verticil-
late; calyx nearly regular.

C. L. Hitchcock
C. V. Muhlick

June 6, 1959

Figure 21. *Lupinus sulphureus* Dougl.

acumen, sometimes glabrous; pods 7.5-9 mm wide, 25-35 mm long, villous, with 3-6 ovules.

This subspecies is found in relatively moist habitats but with some drainage, often in considerable shade, from the Douglas fir, or lodgepole pine zones on up to the aspen, spruce and white-pine zones. The center of distribution is in the mountains of western Montana and northern Idaho. Flowering in June and July.

8. **Lupinus sulphureus** Dougl. ex Hook., Fl. Bor. Am. 1: 166. 1840. (Type: Jct. of Lewis and Clark River with Columbia River, *Douglas*, CGE)

Figures 21 to 23

Common Name: Sulphur-flowered Lupine.

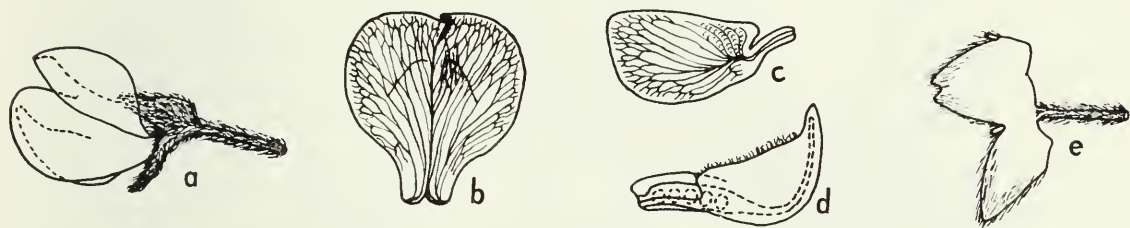


Figure 22. *Lupinus sulphureus* Dougl. (a) flower; (b) glabrous banner, occasionally with a small patch of pubescence; (c) wing; (d) keel; (e) calyx

Plants perennial with several herbaceous stems from a caudex; stems 4-6 dm tall, 3-4 mm in diameter (dried), with two types of hairs but both appressed, strigose to sericeous; leaves cauline, the lower discolored or caducous by full anthesis; longest petioles 9-13 cm long with subulate stipules connate for 3-5 mm; leaflets 10-13, linear-elliptic, sericeous on both sides, conduplicate on drying, largest 4-5.5 cm long, 3.5-5 mm wide, acute; peduncles 3-5 cm long at anthesis

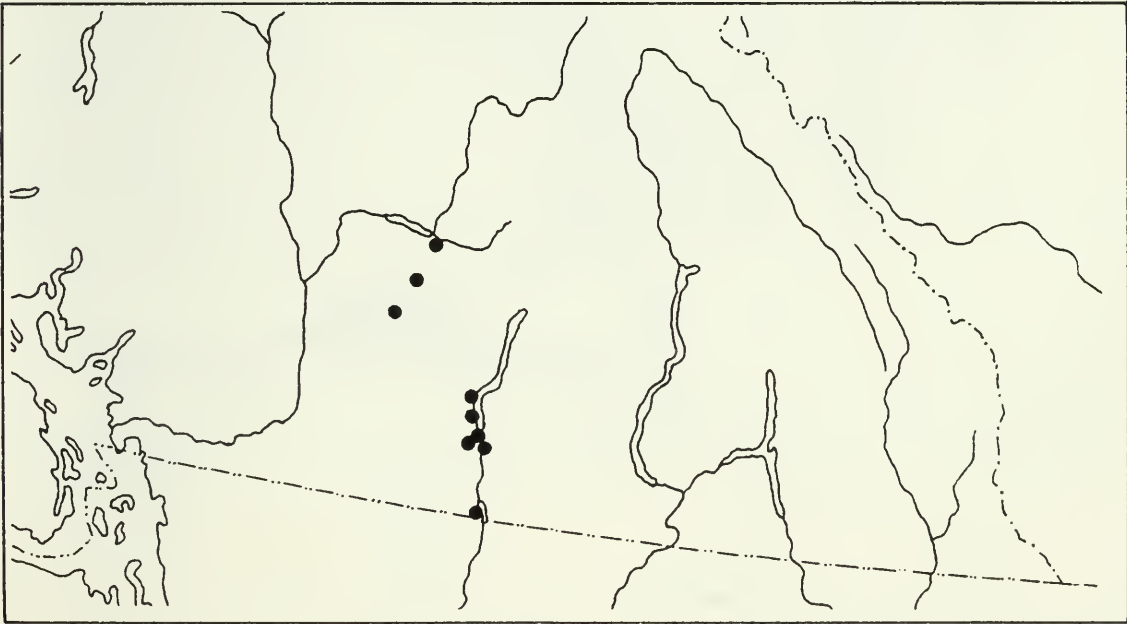


Figure 23. Distribution of *Lupinus sulphureus* Dougl. in British Columbia



PLANT OF *Lupinus*, Heller

Lupinus oreganus Heller (variant)
Duplicate determined U.S. Dum., 1963

collected by Heller, June 1963, at
11.

1116.

1116. J. P. Heller. June 1963
Heller

HERB. MUSEUM OF THE UNIVERSITY OF TORONTO
1116. 1116. 1116.

Figure 24. *Lupinus oreganus* Heller var. *kincaidii* C. P. Smith

and to 8 cm long in fruit; racemes 12-18 cm long, rather dense, verticillate or with scattered flowers; bracts subulate, 3-4 mm long, caducous; pedicels 4-6 mm long, ascending, hispidulous; calyx gibbous above, sericeous-villous; corolla sulphur-yellow to bright canary-yellow; banner reflexed well above the midpoint; villous in the ventral sulcus, thinly pubescent under the upper calyx-lip and sometimes ciliate along the dorsal crest, or glabrous dorsally, 9-10 mm long; wings glabrous, 4 mm wide; keel ciliate along most of the upper margin and often also below the claws; pods densely silky-sericeous, 2-2.5 cm long; ovules 4-5.

Common in eastern Oregon and eastern Washington in sagebrush areas and yellow pine clearings. It occurs in the Columbia River area in southern B.C., north to Kamloops. Flowering from May to June.

9. ***Lupinus oreganus* Heller var. *kincaidii* C. P. Smith**, Bull. Torrey Club **51**: 305. 1924. (Type: Corvallis, Benton Co., Oregon, *Kincaid*, 8 June 1888, WS)

Figures 24 and 25

L. sulphureus Dougl. subsp. *kincaidii* (C. P. Smith) Phillips, Res. Stud. St. Coll. Wash. **23**: 193. 1955.

L. sulphureus Dougl. var. *kincaidii* (C. P. Smith) C. L. Hitchc., Vasc. Pl. Pac. Northwest, pt. **3**: 330. 1961.

Common Name: Oregon Lupine.

Plants perennial, with a branched caudex, 3-5 dm tall; stems slender, 2-3 mm in diameter, finely puberulent with longer appressed strigose hairs; radicle and lower cauline leaves with petioles 8-12 cm long, the upper only 3-6 cm long, generally 3-4 cauline nodes; stipules setaceous, 4-6 mm long, connate only 1-3 mm; leaflets 8-10, linear-oblongate, 4-6 cm long, 5-8 mm wide, thinly strigose beneath, glabrous above, acute-mucronate; peduncles 6-10 cm long; racemes 10-20 cm long, dense, flowers scattered to subverticillate; bracts broadly lanceolate, 4-6 mm long; pedicels 5-7 mm long at anthesis, ascending hispidulose; calyx sericeous without, glabrous within, lower lip minutely trifid, 5-7 mm long, the upper lip 4-5 mm long, bifid, the notch ca. 0.4 mm deep; banner glabrous, oblong, truncate-emarginate at the tip, 8-9 mm long, 5-6 mm wide, the narrow sides not covering the tip of the upper calyx-lip when fresh, barely covering it when pressed, reflexed well beyond the midpoint, resulting in a very small notch between the wing tips and the banner tip; wings oblong, 8-9 mm long, 3.5-4 mm wide; keel

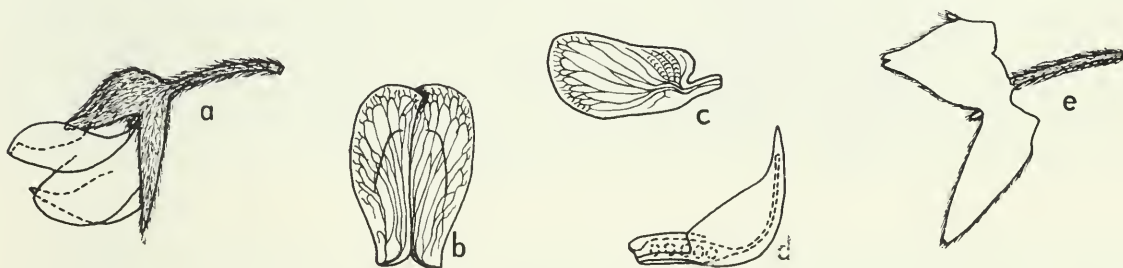


Figure 25. *Lupinus oreganus* Heller var. *kincaidii* C. P. Smith (a) flower; (b) glabrous banner; (c) wing; (d) keel; (e) calyx, showing glabrous interior



Figure 26. *Lupinus leucophyllus* Dougl.

glabrous, the angle less than 90°, the acumen very slender, commonly referred to as falcate; ovules 4; pods not available. No map.

Flowering from June through July.

The taxon is probably adventive on Vancouver Island, B.C., because it is not known in Washington and was originally described from Oregon. However, the Vancouver Island population may represent a relict of an ancient broad-ranging one. It is related to *L. sulphureus* Dougl. but is clearly distinguished by characters of the floral parts and by the glabrous upper leaf surfaces. These characters suggest more than varietal status for *L. oregonus*.

The taxon has been recorded only from Oak Bay Flat, Victoria, B.C. (*Connell in 1924*) (V) and Victoria, *Priestly 8704* (V).

10. ***Lupinus leucophyllus*** Dougl. in Lindl. Bot. Reg. **13**: t. 1124. 1827. (Type: Northwest coast of America, *Douglas in 1826*, CGE)

Figures 26 and 27

L. plumosus Dougl. in Lindl. Bot. Reg. **13**: t. 1217, 1829. (Type: *Douglas*, CGE)

L. cyaneus Rydb., Bull. Torrey Club **28**: 35. 1901. (Type: Montana, Wilcox 446, US)

L. macrostachys Rydb., loc. cit. **34**: 44. 1907. (Type: Jocko Creek, Montana, *MacDougal 253*, NY)

L. enodatus C. P. Smith, Sp. Lup. 689. 1951. (Type: Bluffs at Lewiston, Idaho, *Benson 1646*, POM)

L. forslingi C. P. Smith, Sp. Lup. 743. 1952. (Type: Sheep Exp. Station, Idaho, *Forslingi s-27*, USFS 44542)

Common Name: Woolly-leaved Lupine.

Plants perennial, 5-9 dm tall, densely woolly and with additional longer spreading or retrose hairs on the stems; lower petioles 8-18 cm long; leaflets 7-10, 4-7 cm long, 9-13 mm wide, woolly on both sides, elliptic-oblongate; peduncles 3-8 cm long; racemes 10-40 cm long, densely verticillate; bracts caducous, short subulate to long attenuate; pedicels 1.5-3 mm long, flowers 10-12 mm long,

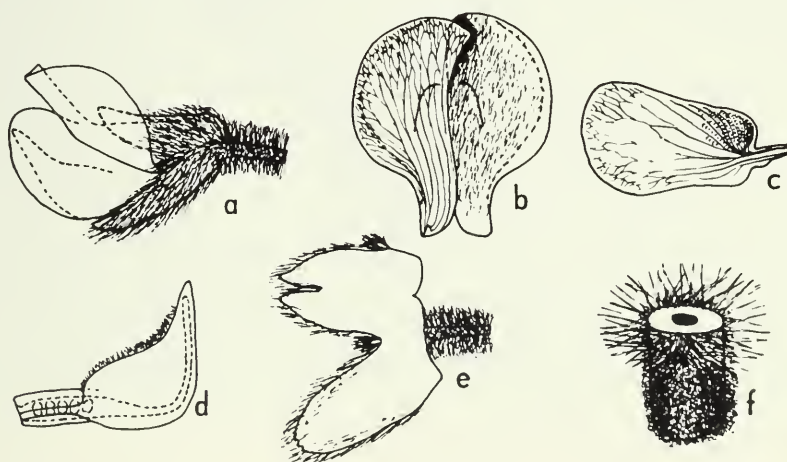


Figure 27. *Lupinus leucophyllus* Dougl. (a) flower; (b) banner, showing reflexing above midpoint and along side, vein pattern on left, pubescence on right; (c) wing; (d) keel; (e) calyx, showing interior pubescence; (f) stem segment, showing pilose hairs and woolly undercoat of tangled hairs



Figure 28. *Lupinus sericeus* Pursh

commonly pale lavender; banner densely pubescent on the back, reflexed above the midpoint; a very small opening between the tip of the banner and the tip of the wings; wings glabrous 10-12 mm long; keel ciliate along the entire upper margin; pods lanate, 20-24 mm long, 5.5-6.5 mm wide; ovules 4-6. No map.

The first two synonyms listed above are variants of inadequately known distribution and nature. The species is found associated with *Artemisia tridentata*, in grassy clearings up into the yellow pine belt from southern B.C., se to Wyoming and Utah, and s to California. Material seen occasionally hybridizing in nature with *L. sericeus* Pursh. Flowering from June to August.

This species has been recorded only from Lumby, B.C., by *Eastham 13041* (V) and several other collections exist from the same place.

11a. *Lupinus sericeus* Pursh var. *sericeus*, Fl. Am. Sept. 2: 468. 1814. (Type: Kooskooskii River (now Lewis & Clark River, Idaho), *Lewis in 1806*, PH)

Figures 28 to 30

L. leucopsis Agardh, Syn. Gen. Lup. 29. 1835. (Type: Northwest America, *Douglas*, CGE)

L. flavicaulis Rydb., Bull. Torrey Club 34: 44. 1907. (Type: Snake River, *Nelson 1098*, NY, Columbia Univ.)

L. flasocomatus C. P. Smith, Sp. Lup. 736. 1952. (Type: Fall Creek, Boise Nat. Forest, Idaho, *Pearse 38*, USFS)

L. herman-workii C. P. Smith, loc. cit. 741. 1952. (Type: Head of Swamp Creek, Challis Nat. Forest, Idaho, *Work 421*, USFS)

Common Name: Silky Lupine.

Plants 3-6 dm tall, branching at most of the upper nodes, sericeous throughout, usually densely so; basal leaves often present at anthesis, with numerous cauline leaves; lower petioles 3.5-9 cm long, gradated upward to only 2-2.5 cm long at the top node; leaflets 5-9, the largest 3.5-6 cm long, 5-11 mm wide, usually densely sericeous on both sides with appressed hairs, acute to obtuse, mucronate; peduncles 2-5.5 cm long, the longest at fruiting; racemes lax or dense, 10-20 cm long; pedicels hispidulous, 3.5-6 mm long, the longer in fruit; bracts subulate to lanceolate, caducous to persistent, 4-10 mm long; flowers 11-13 mm long; calyx densely canescent, the upper lip 4-7 mm long; the lower lip 6-8.5 mm long, sericeous inside most of the calyx; banner sericeous over most of the dorsal area along the crest and sometimes to the margins, densest on the distal half, obovate, reflexed at or below the midpoint; wings glabrous, 4-6 mm wide, 9-13 mm long, often not covering the umbo of the keel; keel ciliate along the upper edges toward the acumen; pods 2.5-3.5 cm long, 7-8 mm wide, densely sericeous; ovules 4-6.

This species is one of the commonest and most widespread of the lupines, ranging from British Columbia to New Mexico and Arizona, generally distributed in the *Artemisia* association, but extending into clearings in yellow pine forests. Altitudinally, the distribution varies with latitude and rainfall. Flowering from June through August.

11b. *Lupinus sericeus* Pursh var. *flexuosus* (Lindl. ex Agardh) C. P. Smith, Bull. Torrey Club 51: 307. 1924.

L. flexuosus Lindl. ex Agardh, Syn. Gen. Lup. 34. 1835. (Type: *Douglas*, CGE)

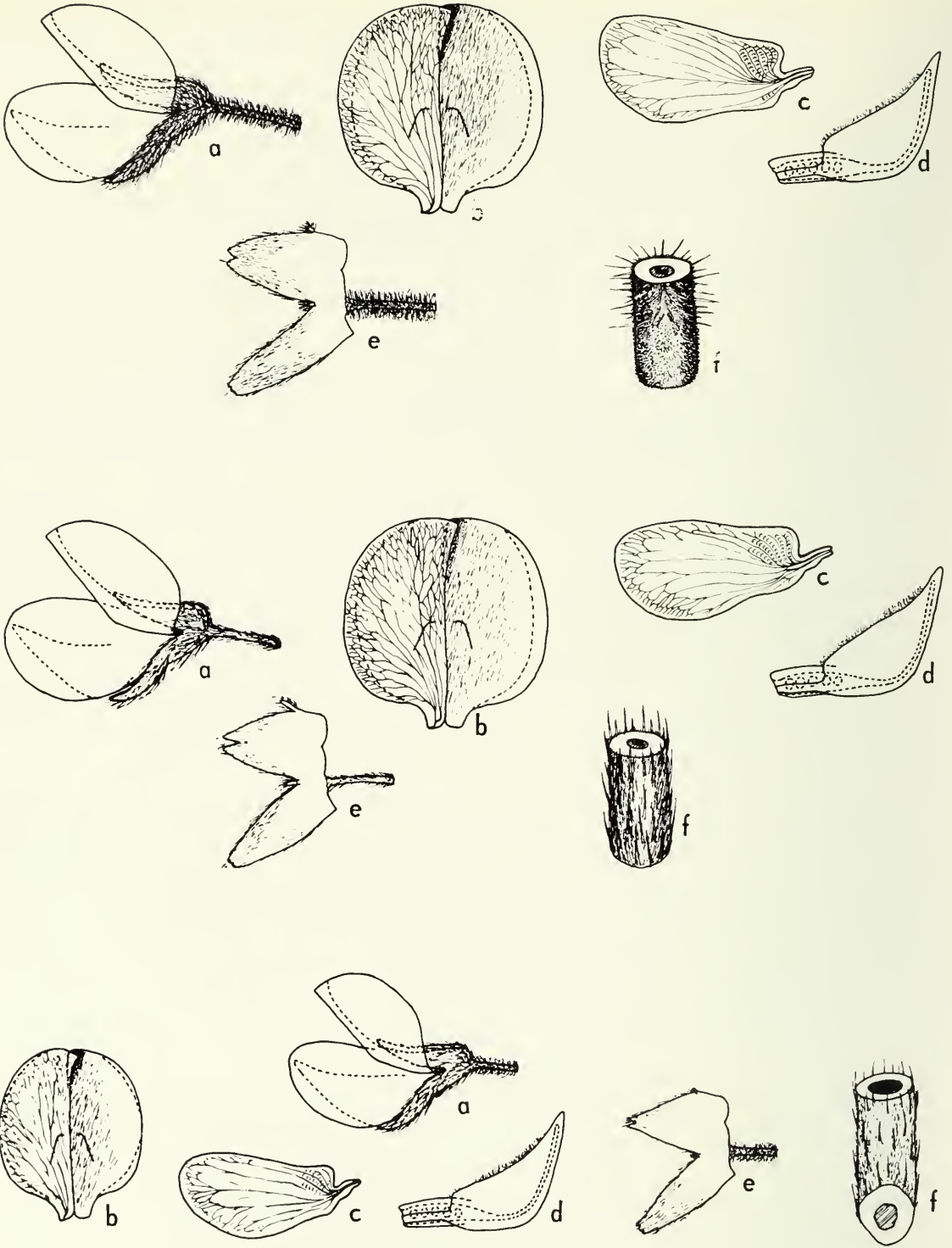


Figure 29. *Lupinus sericeus* Pursh Upper row, var. *egglestonianus* C. P. Smith (a) flower; (b) banner, showing reflexing at or below midpoint; (c) wing; (d) keel; (e) calyx; (f) stem segment, showing pilose hairs and hispidulous undercoat. Middle row, var. *sericeus* (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem, showing appressed pilose hairs and sericeous undercoat. Lower row, var. *flexuosus* (Lindl. ex. Agardh) C. P. Smith, showing small floral parts (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem pubescence

L. subulatus Rydb., Bull. Torrey Club **34**: 43. 1907. (Type: Columbia Falls, Montana, *Williams in 1897*, NY)

The material recognized here is sympatric with var. *sericeus*. It is found among the taller plants, the stems being more slender and appressed pubescent, the hairs somewhat sparser throughout; the flowers often in more lax racemes and only 9-11 mm long.

At present the variety appears to occur randomly within the species but it is distinctive enough to be twice described as a distinct species by capable botanists. Flowering is from May through August.

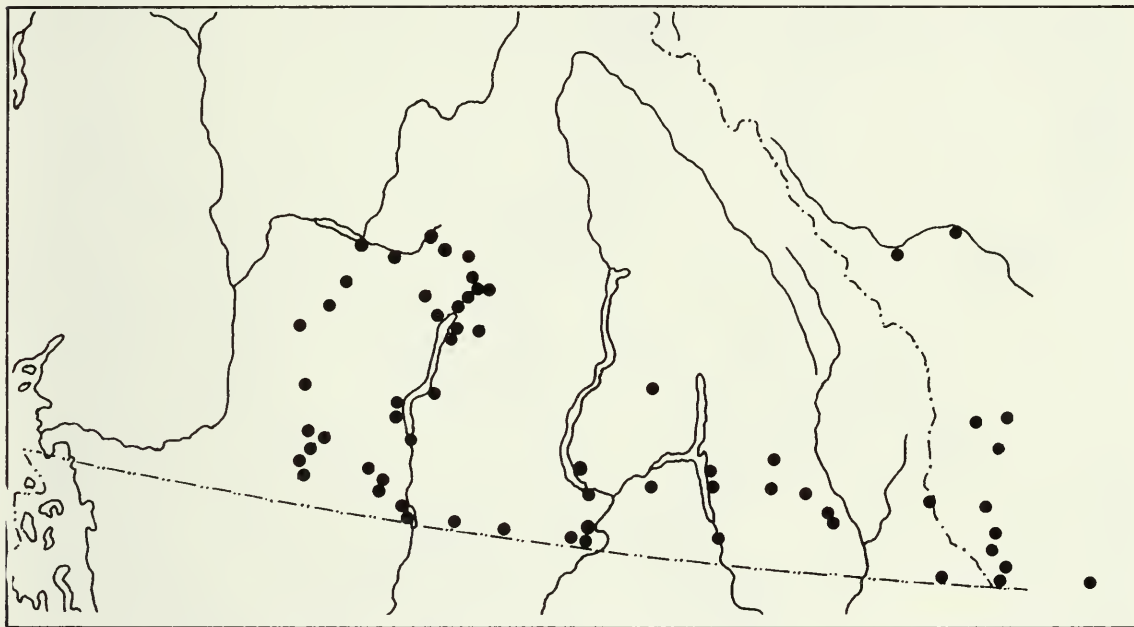


Figure 30. Distribution of *Lupinus sericeus* Pursh in British Columbia

11c. *Lupinus sericeus* Pursh var. *egglestonianus* C. P. Smith, Sp. Lup. 104. 1939. (Type: Grass Valley, Sherman Co., Oregon, *Smith 35127*, DS)

Figure 29

L. ramosus Nels., Bot. Gaz. **30**: 120. 1900. (Type: Banks of Snake River, Wyoming, *A. Nelson & E. Nelson 6576*, MIN)

L. buckinghami C. P. Smith, Sp. Lup. 741. 1952. (Type: Challis Nat. Forest, Custer Co., Idaho, *Buckingham 103*, USFS 68493)

L. hiulcoflorus C. P. Smith, loc. cit. 744. 1952. (Type: Targhee Forest, Fremont Co., Idaho, *Pickett 35*, USFS 51522)

L. spiraeophilus C. P. Smith, loc. cit. 746. 1952. (Type: Targhee Forest, Fremont Co., Idaho, *Hall RH-122*, USFS 84658)

Plants differing from var. *sericeus* in having basal leaves with petioles 9-11 cm long; stems densely spreading hispid, often becoming ferruginous on drying; largest leaflets sericeous on both sides, 6-12 mm wide.

L. sericeus var. *egglestonianus* is completely sympatric with the other varieties and probably consists of introgressants with *L. leucophyllus* Dougl. Southern B.C. south to eastern Oregon and east to Montana. In flower from May to August.

LUPINUS FORMOSUS Greene var *bridgesii*
(S WATTS) Greene

DB DUNN ON D-PL.
OCT 1963
Department of Agriculture, Ottawa

SA 75

Lupinus formosus (Greene) Greene
var. *bridgesii* (S. Wats.) Greene
C. G. Dunn, Oct. 1963

19805 *Lupinus formosus* (Greene) Greene
San Antonio Canyon, San Bernardino
County, California

PLANTS OF

Figure 31. *Lupinus formosus* Greene var. *bridgesii* (S. Wats.) Greene

12. **Lupinus formosus** Greene var. **bridgesii** (S. Wats.) Greene, Fl. Fran. 42. 1891.

Figures 31 and 32

L. albicaulis Dougl. in Hook. var. *bridgesii* S. Wats., Proc. Am. Acad. 8: 527. 1873.
(Type: Near San Francisco, GH)

L. bridgesii (S. Wats.) Heller, Muhlenbergia 1: 112. 1905, non Gray & Wats.

L. greenei Heller, Muhlenbergia 6: 72. 1910, non Nelson, 1909, new name for *L. albicaulis* var. *bridgesii* S. Wats.

Common Name: Bridge's Lupine, Summer Lupine.

Plants perennial with decumbent to ascending, solid stems, 4-5 mm in diameter, 3-6 dm tall, with abundant finely canescent, kinky hairs and longer spreading or ascending pilose to hirsute hairs, 2-3 mm long; petioles with similar pubescence, 2.0-4.5 cm long; stipules subulate, 6-10 mm long, the lower ones connate to the petiole for 3-4 mm; leaflets 6-8, the largest 3-4 cm long, 8-10 mm wide, oblanceolate, obtuse-rounded tips, mucronate, densely sericeous on both surfaces; peduncles 7-10 cm on primary inflorescence, 3-5 cm on branches; racemes 2.0-3.0 dm on primary, the secondary 8-10 cm long, generally verticillate or subverticillate, the lower 2-3 cm distant; bracts caducous, 5-6 mm long, attenuate-subulate; pedicels 2-3 mm long, densely spreading hispidulous; calyx densely sericeous to canescent outside and glabrous over most of the inside but sericeous near the tips of the lips, upper lip 8.5-10.5 mm long, bifid, the notch 1.5-2.5 mm deep, the lower lip 9-12 mm long, tridentate or entire; banner suborbicular, 11.5-13 mm wide, 11.5-13 mm long, reflexed at the midpoint but leaving a narrow notch between the banner tip and the wings, the point of the banner extending beyond the reflexed sides, in bud arcuate; wings 13-15 mm long, 6.5-7.5 mm wide; keel glabrous, falcate, 4-4.5 mm wide at the midpoint, the acumen slender-arcuate, the angle 80°-85°; ovules 4-5; pods 2.5-3 cm long, 8-9 mm wide, canescent, also with long pilose hairs. No map.

This taxon is part of the *L. albicaulis* Dougl. complex which extends from Baja California to the southern part of Oregon and apparently was introduced on Vancouver Island, where a colony became established in the Victoria area. The

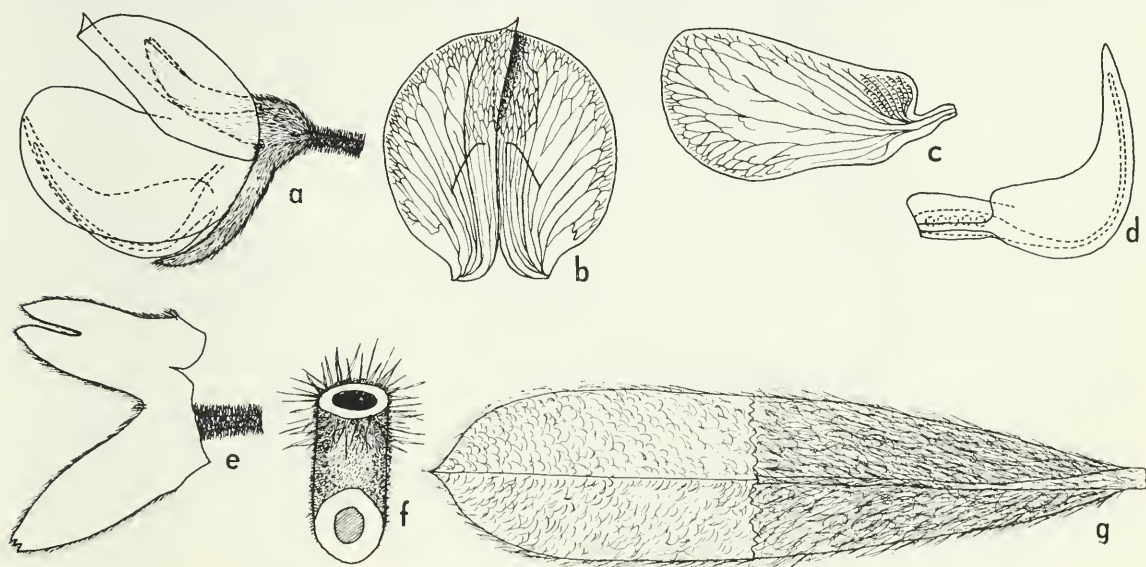


Figure 32. *Lupinus formosus* Greene var. *bridgesii* (S. Wats.) Greene (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem segment, showing pithy (sometimes hollow) center and hirsute pubescence and hispidulous undercoat; (g) leaflet, showing upper surface at left, lower surface at right



PLANTS OF YUKON TERRITORY, CANADA (2)
Lupinus kuschei Eastw.
Yukon Territory, Canada
Div. of Botany, Science Service
Department of Agriculture, Ottawa, Canada
Y. N. S.
P. M.

Figure 33. *Lupinus kuschei* Eastw.

group is still poorly understood. On Vancouver Island, flowering from June to August.

13. **Lupinus kuschei** Eastw., Leaf. West. Bot. 3: 170, 1942. Type: Carcross, Yukon, *Eastwood*, 16 July 1914, CAS)

Figures 33, 34 and 75

L. jacob-andersoni C. P. Smith, Sp. Lup. 658. 1949. (Type, Whitehorse, Yukon, *Anderson* 9535, 29 July 1944, CAN, ISC)

L. porsildianus C. P. Smith, Sp. Lup. 659. 1949. (Type: Whitehorse, Yukon, *Porsild & Breitung* 9193, CAN, GH)

Common Name: Yukon Lupine, Kusche's Lupine.

Plants perennial from a woody caudex, with many flowering stems each year, caespitose, dying back to ground level annually, entire plant densely silky-sericeous except the corolla; stems 1.5-3.0 dm tall, with 3-4 cauline leaves; lower petioles to 9 cm long, the upper 2-3 cm long; primary cauline leaves with a fascicle of several axillary leaves; leaflets 6-8, elliptic-oblongate, acute, mucronate, sericeous on both sides but greener above, largest 3-4 cm long and 4-7 mm wide; peduncles 2.5-5 cm long; racemes dense, of 3-6 verticils, bracts lance-subulate, subpersistent, 7-10 mm long; pedicels 3-5 mm long with abundant spreading villi; calyx slightly gibbous above near the base, the lower lip 6-7 mm long, tridentate, the upper lip 5-6 mm long, 2-lobed; corolla bright blue, entirely glabrous, or a few minute cilia above toward the acumen of the keel; flowers 11-13 mm long; banner reflexed at or below the midpoint, with a light-yellow centerspot; wings 4-6.5 mm wide; pods soft villous, 15-25 mm long, 6-7 mm wide; ovules 4-6.

Lupinus kuschei appears to be restricted to northern B.C. and adjacent Yukon, but occurs within a few miles of the Alaskan border near Carcross and may be found in southern Alaska. A specimen collected by J. August Kusche cited by Eastwood was from Whitehorse, Yukon. Morphological characters suggest that this taxon may have arisen through hybridization between *L. arcticus* S. Wats. and *L. sericeus* Pursh in the manner described in Anderson's *Introgressive Hybridization*. The vegetative

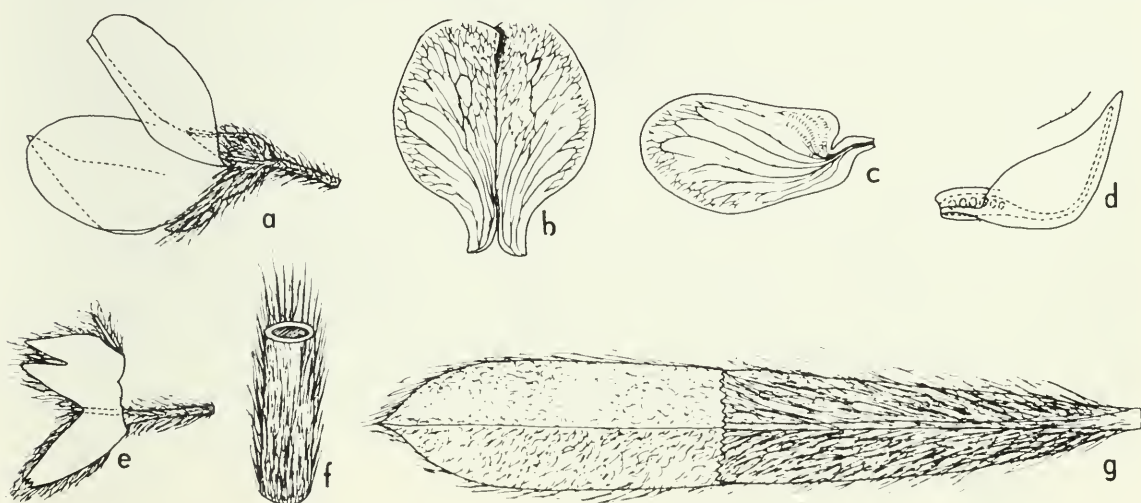


Figure 34. *Lupinus kuschei* Eastw. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx showing ascending hairs; (f) stem segment, showing pubescence and solid pith; (g) leaflet, upper canescent surface at left, lower shaggy-villous surface at right



FLORA OF WASHINGTON

21831 *Lupinus lepidus* Dougl. ex
Lindl. var. *lepidus*

ASOTIN CO: Rocky knoll along Petty Ridge
17 mi. s.w. of Asotin, in T8N, R44E,
Sect. 30.

Flowers verticillate; banner well re-
flexed, blue with white center; calyx
nearly regular; plants multistemmed,
upper lip of calyx deeply bifid.

C. L. Hitchcock
C. V. Muhlick

June 10, 1959

Figure 35. *Lupinus lepidus* Dougl.

traits and floral structure are more like those of *L. sericeus* but the caudex, physiology, glabrous flowers and gibbous calyx are similar to *L. arcticus*. At present, hybrids have been found with *L. arcticus* only. Habitats include open lodgepole pine forest and river terraces. Flowering is in June through August.

14. **Lupinus lepidus** Dougl., Bot. Reg. 14: t. 1149. 1828. (Type: Northwest America, Northwest coast, *Douglas in 1826*, CGE)

Figures 35 to 37

Common Name: Prairie Lupine.

Plants perennial, caespitose from a caudex, 2-4.5 dm tall; stems slender 2-5 mm in diameter, sericeous with some longer pilose ascending hairs, 1-4 cauline leaves; petioles of lower leaves 12-16 cm long, most of these radical; leaflets 6-10, elliptic-oblongate, to 5.5 cm long and to 6.6 mm wide, mostly conduplicate, arcuate, finely sericeous on both surfaces, acute, mucronate; peduncles 9-10 cm long; pedicels 2 mm long; calyx sericeous-villous, both lips 6-7 mm long, the upper bifid; flowers scattered, quite slender viewed laterally, 10-12 mm long; banner obovate, 9-10 mm long, 6-7 mm wide, reflexed below the midpoint, glabrous; wings glabrous, only 3-4 mm wide; keel angle 100°-120°, ciliate above toward the acumen; ovules 3-5; pods not available.

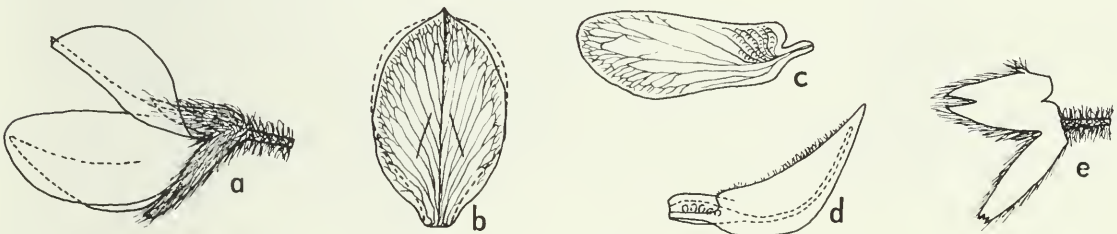


Figure 36. *Lupinus lepidus* Dougl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx



Figure 37. Distribution of *Lupinus lepidus* Dougl. in British Columbia



PLANTS OF BRITISH COLUMBIA, CANADA

BOTANY DIVISION, SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

Figure 38. *Lupinus lyallii* A. Gray

The above description is primarily from the type material which was from the northwest coastal area of North America. The species (*sensu stricto*) ranges from the valleys west of the Cascade Mountains to North Oregon and Washington to southwestern B.C. It extends eastward along the Columbia River as far as Hood River County, Oregon. This is considered to be one taxon of a complex extending southward into montane southern California. Flowering March to June.

15. **Lupinus lyallii** A. Gray, Proc. Amer. Acad. 7: 334. 1868. (Type: Summit of the Cascade Mts., lat. 49°, *Lyall*, BM, GH)

Figures 38 to 40

L. alpinus Heller, Muhlenbergia 6: 22. 1910. (Type: Mt. Rose, Washoe Co., Nevada, *Heller 9914a*, NEV, MIN, NMC, POM)

L. lepidus Dougl. subsp. *lyallii* (A. Gray) Detling, Am. Midl. Nat. 45: 490. 1951.

Common Name: Low Mountain Lupine.

Plants perennial, matlike cespitose clumps, the caudex branched in older plants; stems poorly developed; the foliage appearing radicle, commonly only 5-8

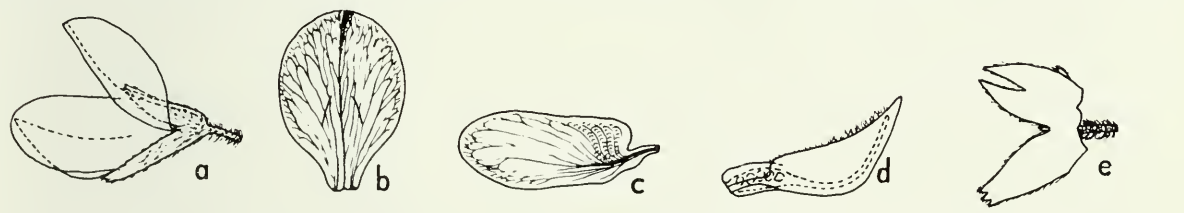


Figure 39. *Lupinus lyallii* A. Gray (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

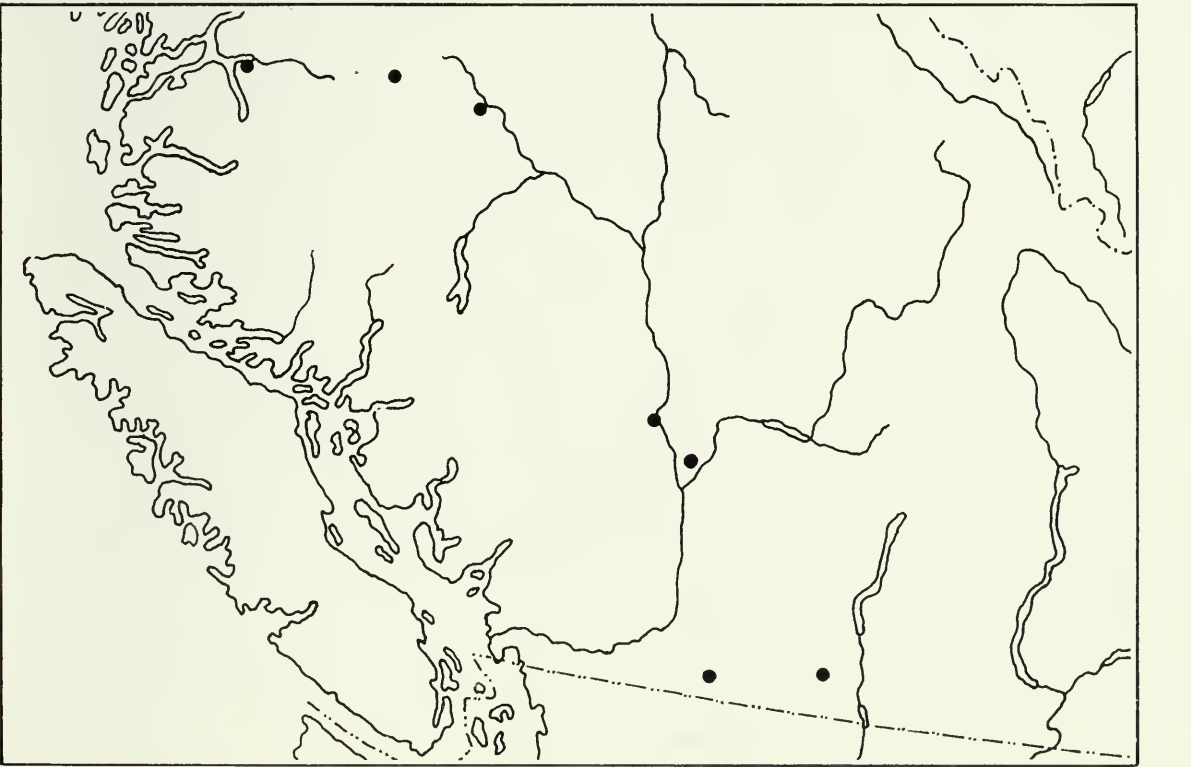


Figure 40. Distribution of *Lupinus lyallii* A. Gray in British Columbia

cm tall; lower petioles 4-6 cm long, these and the peduncles commonly spreading-decumbent; finely sericeous throughout with appressed hairs, the longest only 1 mm long; leaflets 5-7, elliptic-oblongate to obovate, the largest 10-15 mm long, 3-5 mm wide, sericeous on both sides; peduncles 4-10 cm long, exceeding the foliage; racemes dense, 1-2 cm long, occasionally 3-4 cm at anthesis and 5-6 cm in fruit; bracts subulate, persistent, 2-3 mm long; pedicels 1-1.5 mm long; the flowers appearing slender or narrow viewed laterally, banner 7-9 mm long, oblong-elliptical to narrowly obovate; keel sparsely to densely lanate-ciliate above near the acumen; pods 12-15 mm long, 5 mm wide, sericeous; ovules 1-4.

Plants of alpine meadows or of open gravelly slopes, near or above timberline, from the Sierra Nevada mountains of California to southern B.C. occurring from 7,500 to 10,000 ft elevation depending on latitude. Flowering in July and August.

16. **Lupinus minimus** Dougl. in Hook., Fl. Bor. Amer. 1: 163. 1834. (Type: Vicinity of Kettle Falls, *Douglas in 1826*, CGE)

Figures 41 and 42

L. ovinus Greene, Leaf. Bot. Obs. & Crit. 2: 233. 1912. (Type: Sheep Mt., Waterton Lake, 31 July 1895, *Macoun 10413*, CAN)

Common Name: Least Lupine.

Plants perennial, herbaceous, caespitose, appressed silky-sericeous throughout, 1-2 dm tall; stems with only 1-3 cauline leaves, the leaves mostly basal from radical shoots; longest petioles 6-12 cm long; leaflets 6-8, elliptic-oblongate, the largest 1.5-2.5 cm long, 4-8 mm wide, both sides sericeous; peduncles 3-10 cm long; racemes 5-13 cm long, verticillate to subverticillate, these 5-20 mm distant; bracts subulate, tardily deciduous; pedicels 2-3 mm, occasionally 5 mm long; calyx lips nearly equal, the lower lip 6-7 mm long, the upper lip 5-6 mm long, the upper two lobed, with the sinus 2-3.5 mm deep, sericeous without, glabrous within; banner glabrous, reflexed near the midpoint, obovate to orbicular 9.5-11.5 mm long, 9.5-10 mm wide; wings 10.5-13 mm long, glabrous; keel finely ciliate above, densest toward the acumen; ovules 4-6; pods not seen. No map.

L. minimus ranges from northeastern Washington to the Columbia River drainage of B.C., the Crowsnest area of Alberta (Sugarloaf Mountain, and 7 mi n of Coleman) and from eastern Washington to western Montana. Flowering from late July through August.

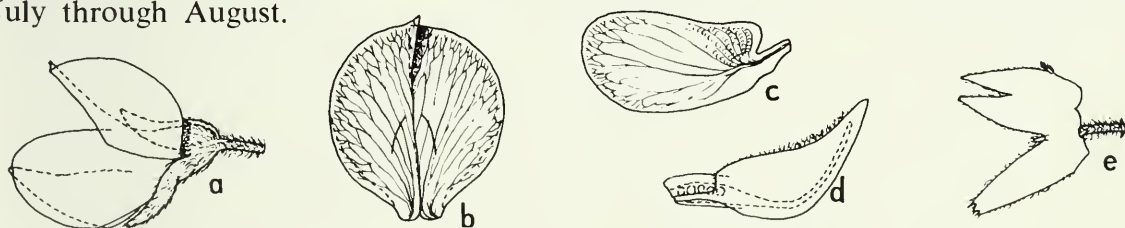


Figure 42. *Lupinus minimus* Dougl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

17. **Lupinus wyethii** S. Wats., Proc. Am. Acad. 8: 525. 1873. (Type: Flathead River, *Wyeth*, 2 May 1833, PH)

Figures 43, 44 and frontispiece

L. humicola A. Nels., Bull. Torrey Club 23: 204. 1898. (Type: Pole Creek, Wyoming, *A. Nelson 151*, isotype POM)

L. arcticus S. Wats. var. *humicola* (A. Nels.) C. P. Smith in Abrams, Ill. Fl. Pac. St. 2: 518. 1944.

Common Name: Wyeth's Lupine.

Plants perennial, 3-5 dm tall, with several stems from a caudex, stems 2-4 mm in diameter, appressed sericeous; petioles of the radicle shoots or lower cauline leaves 8-11 cm long, the upper petioles 1-2 cm long, 2-4 cauline nodes; stipules filiform, 8-15 mm long; leaflets 8-11 on the largest leaves, linear-elliptic to oblanceolate, largest 4.5-6.5 cm long, 5-11 mm wide, acute, mucronate, sericeous on both sides; peduncles 3-8 cm long, surpassing the foliage at anthesis; racemes 7-23 cm long, the flowers commonly scattered but occasionally verticillate; bracts persistent or tardily deciduous, subulate-attenuate, 8-15 mm long; pedicels 3.5-7 mm long, appressed sericeous; calyx silky-sericeous, bracteoles at lateral sinuses 0.5-1.8 mm long, upper lip 5-6.7 mm long, gibbous at the base, bidentate at the apex, the notch 0.1-0.5 mm deep, lower lip almost entire to slightly tridentate at the tip, 6-7.8 mm long, both lips sericeous within near their tips; flowers blue, rarely white; banner glabrous, orbicular, reflexed at the midpoint, 11.5-14 mm long, 11.5-14 mm wide; wings glabrous, 6.5-7 mm wide, 12.5-14 mm long; keel 4-5 mm wide at the middle, ciliate along most of the upper edge, densest toward the acumen, the

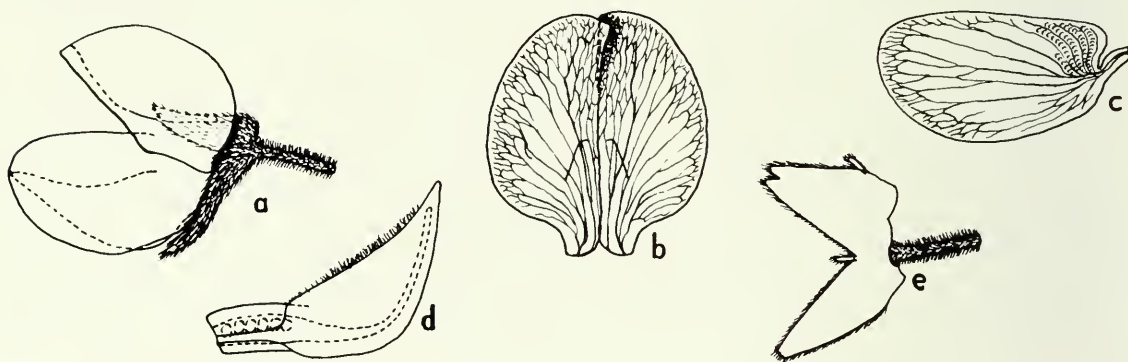


Figure 43. *Lupinus wyethii* S. Wats. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

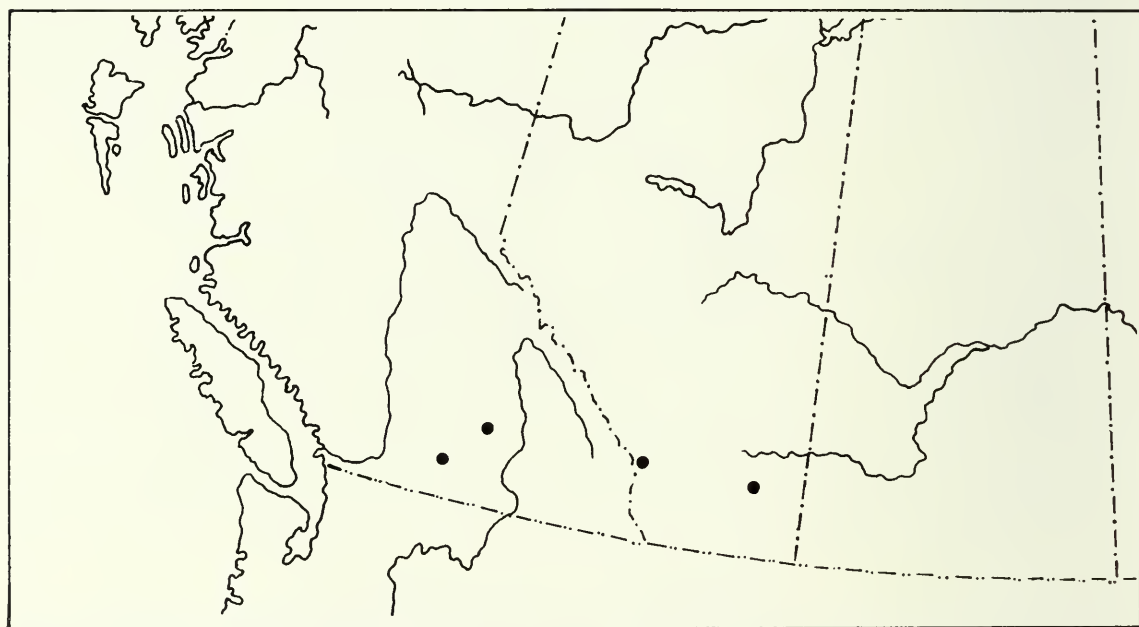


Figure 44. Distribution of *Lupinus wyethii* S. Wats.



Annotated by:

Date:

Lupinus parvislorus Nutt.

PLANTS OF SASKATCHEWAN
DIVISION OF BOTANY SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE OTTAWA CANADA

NO. 1000 COLL. *Lupinus parvislorus*

Lupinus parvislorus

July 15, 1901

DET.

Figure 45. *Lupinus parvislorus* Nutt.

angle 95° - 115° at anthesis; ovules 5-6; pods 2-2.5 cm long, 6-7 mm wide, densely silky-sericeous; seeds commonly 2-4 per pod, 4.5-5 mm long, 3.5-3.8 mm wide, tan.

Lupinus wyethii and its relatives have been poorly understood chiefly because Watson's description was based on two collections now known to belong to two different species. The Wyeth specimen designated by W. W. Eggleston as the type of *L. wyethii*, and which surely must be accepted as the type, is in early-season condition, having both the leaves and the inflorescence only partially developed. The leaves are sericeous above and below. The paratype from Clearwater River collected by Spalding (GH) is a fully developed specimen having a glabrous upper leaf surface and coarse hirsute hairs on the veins. Watson apparently assumed that he had juvenile and mature material of the same taxon. However, the Spalding specimen is *L. prunophilus* Jones. Juvenile material of *L. prunophilus* has a glabrous upper leaf surface and the coarse hairs on the midvein below. Flowering in Canada from July to August.

18. ***Lupinus parviflorus*** Nutt. in Hook. and Arn., Bot. Beechy Voy. 336. 1840.
(Type: Columbia Plains, Nuttall, PH)

Figures 45 to 47

L. allimicranthus C. P. Smith, Spec. Lup. 318. 1942. (Type: Warm River, Dugway, Fremont Co., Idaho, Davis, IDS)

L. argenteus Pursh subsp. *parviflorus* (Nutt.) Phillips, Res. Stud. St. Coll. Wash. 23: 190. 1955, *pro parte*.

Common Name: Lodgepole Lupine.

Plants 2.5-4.5 dm tall, branching above, one to several stems from a woody caudex; the lower leaves fallen or dwarfed by anthesis; all petioles short, 2-4 cm long; leaflets 7-8, 3-5 cm long, 5-16 mm wide, glabrous above, minutely puberulent below, broadly oblanceolate to obovate, rounded or mucronulate; peduncles 1-6 cm long; racemes 3.5-18 cm long, densely verticillate, these 7-10 mm apart; pedicels 1-3 mm long; flowers 6-7.5 mm long; banner with a sparsely pubescent spot on back in the bud at the tip of the calyx, sometimes glabrate in anthesis, reflexed above the midpoint, 7-8 mm wide, 6-7 mm long; wings glabrous; keel ciliate near the acumen; ovules 3-4; pods 6-6.5 mm wide.

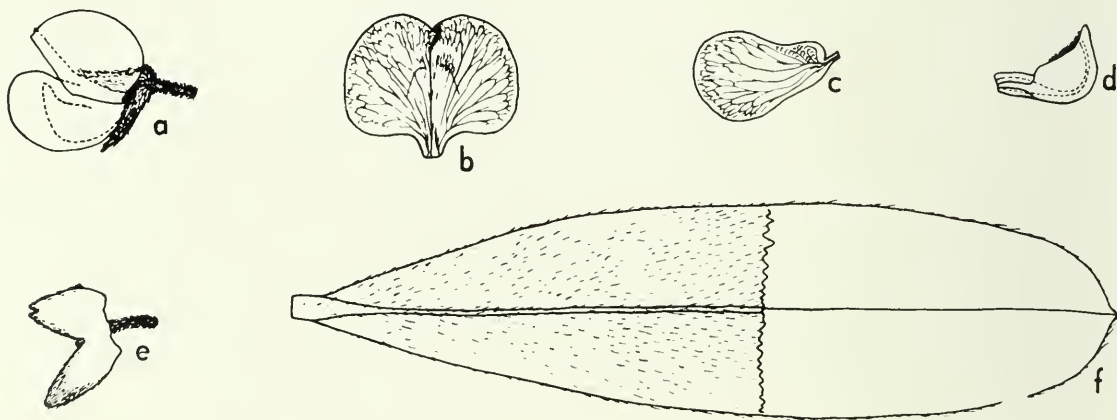


Figure 46. *Lupinus parviflorus* Nutt. (a) lateral view of flower, showing circular outline; (b) banner, showing width and reflexing above midpoint; (c) wing; (d) hooked keel, showing small size; (e) calyx; (f) leaflet, showing pubescent lower surface at left, glabrous upper surface at right

Generally in damp woods with aspen or lodgepole pine but sometimes in drier sites, 5,600 to 8,000 ft elevation. Most common in Wyoming, Idaho and Montana, north to Alberta and Saskatchewan. Flowering in July and August.

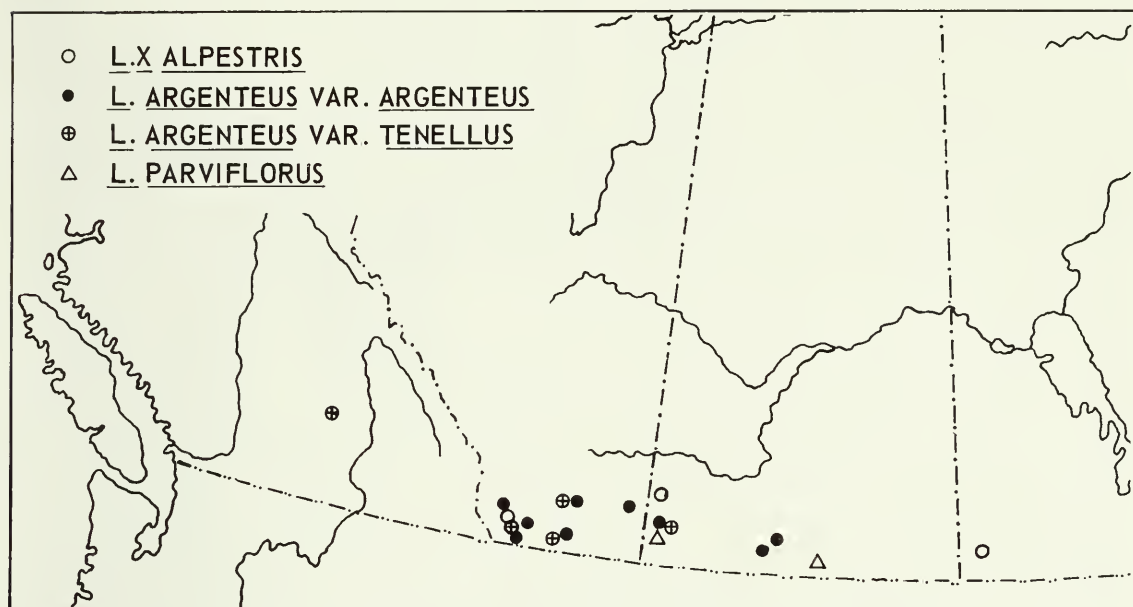


Figure 47. Distribution of the *Lupinus argenteus* complex in Canada

19. **Lupinus** × **alpestris** A. Nels., Bull. Torrey Club **26**: 127. 1899, *pro sp.* (Type: Medicine Bow Mts., Wyoming, *E. Nelson* 5070 RM, topotype *A. Nelson* 7801, POM)

Figures 47 to 49

L. adscendens Rydb., Bull. Torrey Club **30**: 256. 1903. (Type: Tongue River, Bighorn Mts., Wyoming, *Tweedy* 129, NY)

L. laxis Rydb., Bull. Torrey Club **30**: 258. 1903. (Type: Forks of Madison, Montana, *Rydb. & Bessey* 4442, NY)

L. pulcherrimus Rydb., Bull. Torrey Club **30**: 258. 1903. (Type: Battle, Carbon Co., Wyoming, *Tweedy* 4215, NY)

L. macounii Rydb., Bull. Torrey Club **34**: 42. 1907. (Type: Cypress Hills, *Macoun* 4070, NY, isotype CAN)

Plants perennial from a deep, branched woody caudex, usually with several erect stems branching from the upper nodes, lower stem subligneous, often still present the second year; stems 4-6 or 8 dm tall, minutely strigose to sericeous, simple or corymbosely branched; lower petioles 6-13 cm long, the upper 2-5 cm long; leaflets 7-10 on the larger leaves, oblanceolate to linear-oblanceolate, flat or conduplicate, the largest 2.5-6 cm long, 5-10 mm wide, obtuse to rounded and mucronate, very sparingly minutely pubescent above, often appearing glabrous to the unaided eye, minutely sericeous below; peduncles of primary inflorescence 1.5-6 cm long, the secondary ones shorter; racemes 10-15 cm long, the verticils 8-15 mm distant or subverticillate; bracts subulate, caducous to tardily deciduous, 4-6 mm long; pedicels 3-6 mm long at anthesis; calyx sericeous, the upper lip bifid, 4-5.5 mm long; the lower lip tridentate, 5-7 mm long; banner orbicular, reflexed beyond the midpoint, sparsely pubescent dorsally on each side of the ridge beneath the upper lip of the calyx; wings 8-12 mm long, 4-4.5 mm wide; keel



PLANTS OF WYOMING, U. S. A.

Lupinus alpestris of aretensis complex
labeling is premature. Dupl. det. L.B. Dunn,
1963.

Wyoming, Carbon Co. 5.2 miles West of Medicine
Bow Lodge on wyo. Highway 130.

No. 11550

J.N. Gillett June 28, 1962
R.L. Taylor

DIVISION OF BOTANY, SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA
FORM 58 275
12/57-7/59 197

Figure 48. *Lupinus* × *alpestris* A. Nels.

sparsely ciliate toward the acumen; pods 2-3 cm long, 7-8 mm wide, densely sericeous, with 4-5 ovules, commonly few maturing.

Lupinus × *alpestris* is here treated as a hybrid. This population is likely a highly successful polymorphic entity derived from introgression between *L. caudatus* Kell. and *L. argenteus* Pursh, as indicated by the pubescence and long lower petioles. Probably, too, *L. arbustus* Dougl. is involved in this hybridization.

This population extends from montane Arizona to California, Oregon, Colorado and northward to the southern Canadian plains. Because this range is greater than that of either parent, the suggestion is made that it is more successful than either of them. The habitat is forest or woodland clearings, commonly in association with *Artemisia tridentata* and grassland. Flowering in July and August.

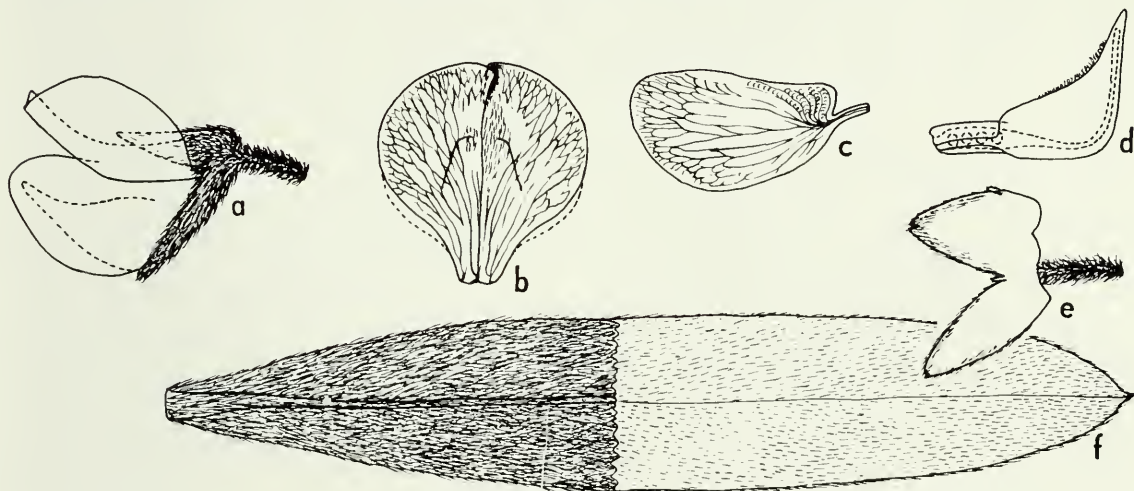


Figure 49. *Lupinus* × *alpestris* A. Nels. (a) flower; (b) banner, showing patch of pubescence; (c) wing; (d) keel; (e) calyx; (f) leaflet, showing sericeous lower surface and puberulent upper surface

20a. ***Lupinus argenteus* Pursh var. *argenteus***, Fl. Sept. 2: 468. 1814. (Type: Banks of Kooskoosky (old Indian name for Clearwater River), *M. Lewis*, June July, in Herb. Lambert. Paratype: On the Cokahlaishkit, *M. Lewis*, 7 July 1806, PH) (The two specimens look alike and were both white-flowered plants, single-gene recessive.)

Figures 47, 50 and 51

L. decumbens Torr., Ann. Lyc. N.Y. 2: 191. 1828. (Type: On the southern branches of the Arkansas, *Torrey*, NY)

L. laxiflorus Dougl. β *foliosus* Nutt. ex Torr. & Gray, Fl. N. Am. 1: 377. 1840.

L. argenteus Pursh var. *decumbens* (A. Gray) S. Wats., Proc. Am. Acad. 8: 532. 1873.

L. foliosus Nutt. ex. Rydb., Fl. Rocky Mts. and Adj. Plains 463. 1917, *non* Hook.

L. garrettianus C. P. Smith, Sp. Lup. 672. 1949. (Type: 1 mi w Duchesne, Duchesne Co., Utah, *Garrett* 8303, UT)

Common Name: Silvery Lupine.

Plants perennial, 4-7 dm tall, with a cluster of branched stems, puberulent to appressed-strigose throughout, except the glabrous upper leaf surface, leafy above, the basal leaves fallen by anthesis; all petioles short, 2-4 cm long; leaflets 7-9, linear-elliptic, often conduplicate, 2.5-3 or 4 cm long, 2-4 or 5 mm wide, with



Figure 50. *Lupinus argenteus* Pursh

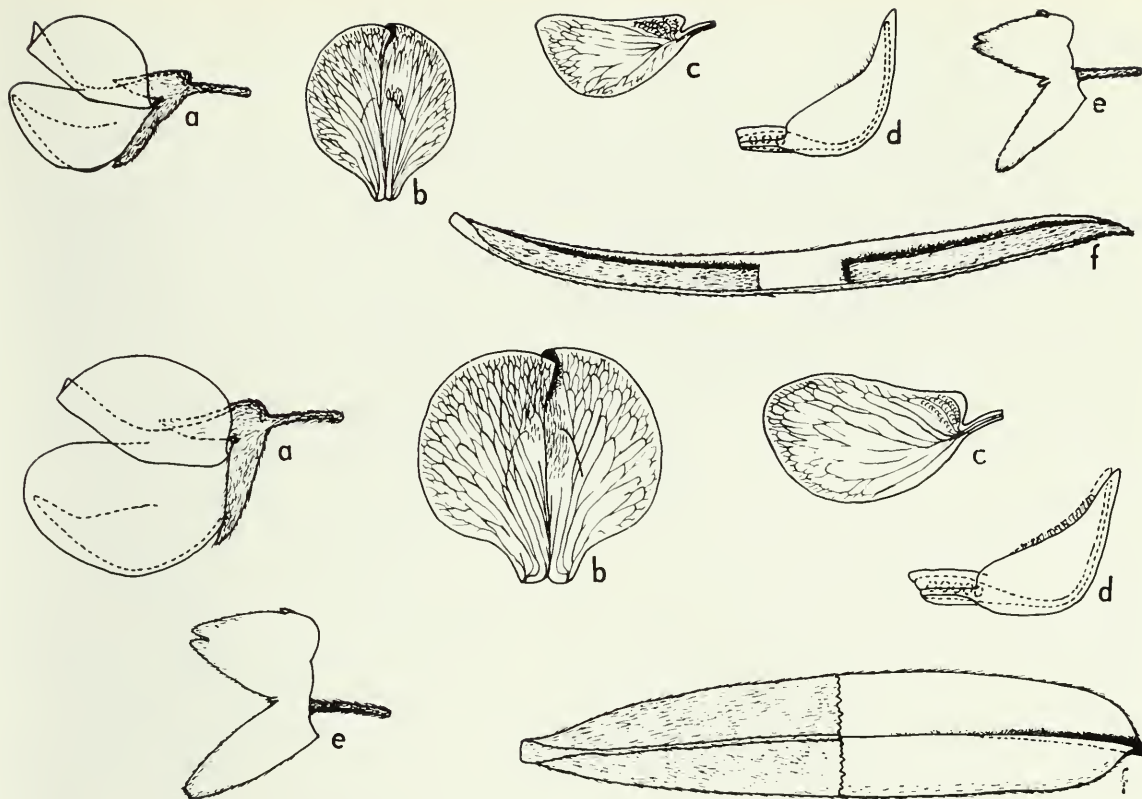


Figure 51. *Lupinus argenteus* Pursh. Upper row, var. *tenellus* (Dougl. ex. G. Don) Dunn (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) leaflet. Lower row, var. *argenteus* (a) flower; (b) banner, showing dorsal pubescent patch; (c) wing; (d) keel; (e) calyx; (f) leaflet, showing finely sericeous lower surface, glabrous to marginally puberulent upper surface

obtuse or acute tips; peduncles 2-4 cm long; racemes 5-12 or rarely 25 cm long, subverticils 10-12 mm apart; bracts subulate, 2-3 mm long, persistent or caducous; pedicels 2-4 mm long; flowers 10-12 mm long, orbicular viewed laterally, generally blue or occasionally off-white; banner orbicular, a spot of pubescence on the back beneath or near the tip of the calyx, reflexed above the midpoint; wings glabrous, 10-12 mm long, 4.5-6 mm wide; keel ciliate along the upper edge near the acumen; pods densely sericeous, 2-3 cm long, 7-8 mm wide; ovules 4-6.

Lupinus argenteus extends from the northeast corner of California to Alberta and Saskatchewan, then southward in the Rocky Mountains to New Mexico. Commonly found from 5,400 to 8,400 ft with *Artemisia* or in timbered creek bottoms. Flowering in Canada from July through August.

20b. ***Lupinus argenteus* Pursh var. *tenellus* (Dougl. ex G. Don) Dunn, Leaf. West. Bot. 7: 254. 1955.**

Figures 47 and 51

L. laxiflorus Dougl. ex Lindl., Bot. Reg. 14: t. 1140. 1828, not of Am. authors. (Type: Based on garden material, see Dunn, 1957)

L. tenellus Dougl. ex G. Don, Gen. Hist. Dichl, Pl. 2: 367. 1832. (Type: On Grand Rapids and on the Multnomah River, Douglas in 1825, CGE)

L. laxiflorus Dougl. γ *tenellus* (Dougl. ex G. Don) Torr. & Gray, Fl. N. Am. 1: 377. 1840.

- L. stenophyllus* Rydb., Bull. Torrey Club **34**: 42. 1907. (Type: Oregon Plains, Nuttall, NY)
- L. argenteus* Pursh var. *stenophyllus* (Rydb.) Davis, Fl. Idaho 439. 1952.
- L. lanatocarinatus* C. P. Smith, Sp. Lup. 317. 1942. (Type: Fort Hall, Bingham Co., Idaho, Davis 137-35, IDS, shows introgression from *L. caudatus*)
- L. fremontensis* C. P. Smith, loc. cit. 320. 1942. (Type: 6 mi nw Anthony, Fremont Co., Idaho, Davis 326, IDS, intermediate to var. *argenteus*)
- L. cariciformes* C. P. Smith, loc. cit. 573. 1946. (Type: 4 mi s Macks Inn, Fremont Co., Idaho, Christ & Ward 14899, NY)
- L. hullianus* C. P. Smith, loc. cit. 573. 1946. (Type: In a 1939 burn, Clark Co., Idaho, Hull 235, USFS 91141, isotype DS)
- L. montis-cookii* C. P. Smith, loc. cit. 726. 1952. (Type: Cook Mt., Clearwater Forest, Idaho, Sutton 70, USFS, 38580, suspect introgression from *L. arbustus* subsp. *pseudoparviflorus*)

Plants similar to *L. argenteus* var. *argenteus*, but often more slender in appearance, differing in pubescence from sericeous to strigose; petioles of the lower leaves, which are often present, up to 8 cm long; leaflets 2-4.5 cm long, 3-6 mm wide, elliptic to linear-oblongate, glabrous or sparsely strigose above; flowers 8-10 mm long; calyx gibbous at the base or distended backward slightly; wings narrow, 4.5 mm wide or less, giving the flower a slender appearance laterally.

Widespread in the Great Basin region from e Oregon to w Colorado, south to Arizona and north to Alberta and Saskatchewan; at 5,000 to 8,400 ft, completely sympatric with var. *argenteus*. Flowering during July and August.

21. ***Lupinus arboreus*** Sims, Bot. Mag. **17**: t. 682. 1803. (Type: Garden plant grown at Kensington, England. Seed from California, CGE)

Figures 52 to 54

Common Name: Tree Lupine.

Plants short-lived suffrutescent perennials, suberect to decumbent; the stems generally 1-1.5 m tall, minutely puberulent, much branched, the foliage with several leaves in the axils of the primary leaves, the short internodes and short petioles causing the appearance of a rather dense covering of leaves; petioles of primary leaves 1.5-3 cm long; stipules subulate 4-15 mm long; leaflets 7-10, the largest 2.5-4.5 cm long, 4-7 mm wide, linear to linear-oblongate, acute to obtuse or rounded, puberulent beneath, glabrous above or in those suspected of introgression sparsely puberulent above; peduncles 5-8 cm long; racemes 10-18 cm long, verticillate or subverticillate, the lower verticils to 4 cm distant; bracts caducous, 5-8 mm long, lanceolate to subulate, densely sericeous; pedicels 6-12 mm long; calyx silky-sericeous, both lips entire or the upper bidentate, the lower deep boat-shaped, 7-12 mm long, deflexed; corolla yellow in the original, blue in introgressants or transitional material; banner orbicular, reflexed below the midpoint, usually glabrous; wings glabrous, 13-21 mm long; keel ciliate most of the length of the upper edges, densest toward the acumen; pods 4.5-5.5 cm long, 9-10 mm wide, soft spreading villous hairs to 2 mm long; ovules 8-11 lying diagonally in the pod, the upper end forward; seeds dark brown to black, evenly distributed.

The species is native to California from San Francisco south to Santa Barbara on the seaward side of the coast ranges. It is often a member of the strand vegetation and always is found in the fog zone. It has been introduced and established in Washington, on Vancouver Island in British Columbia, in Chile,



Figure 52. *Lupinus arboreus* Sims

and in London, England, it has become weedy. It is very showy as an ornamental but is difficult to grow outside of the coastal fog zone. Flowering from May to July.

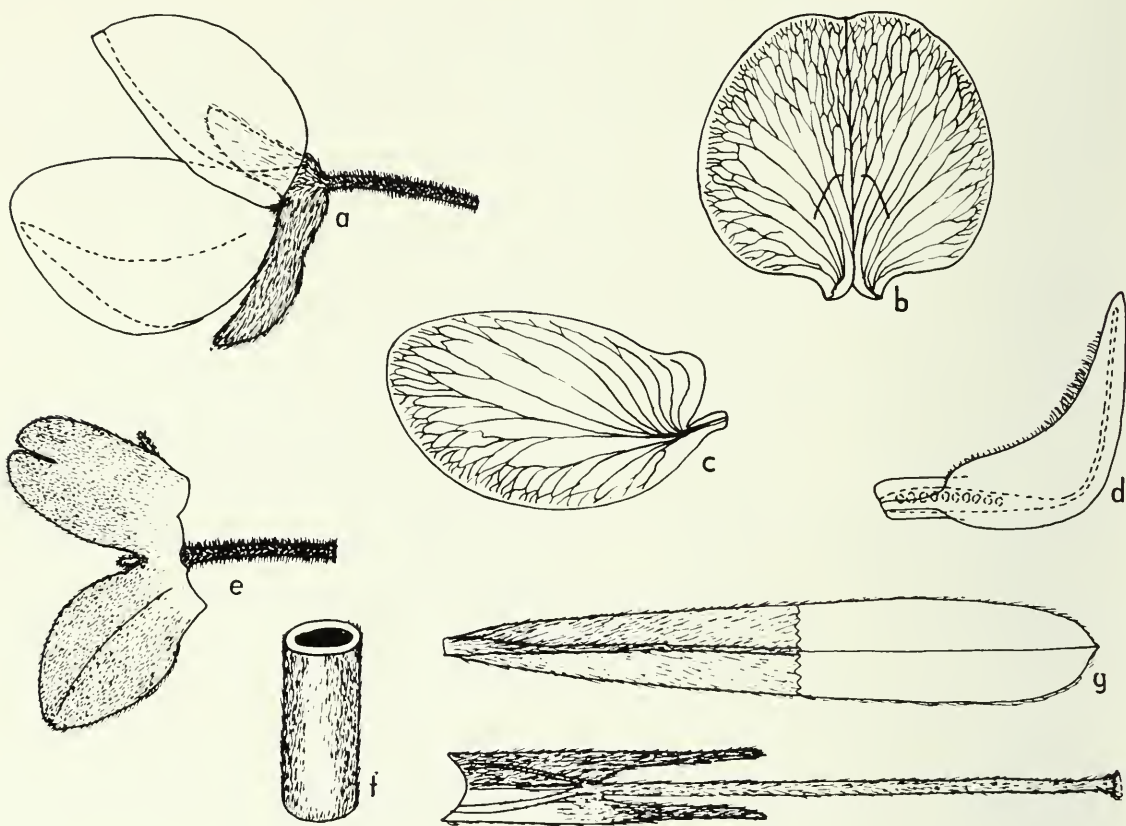


Figure 53. *Lupinus arboreus* Sims (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem segment; (g) leaflet, petiole and stipules (adaxial below)



Figure 54. Distribution of *Lupinus arboreus* Sims in British Columbia



Distributed by the Herbarium of the University of California

Plants of Northern Coast Region of California

COLLECTED BY ALTON S. BULLOCK

ALTON S. BULLOCK

Figure 55. *Lupinus rivularis* Dougl.

22. *Lupinus rivularis* Dougl. ex Lindl. Bot. Reg. 19: t. 1595. 1833. (Type: America Boreali-occidentalis, *Douglas* 263, 1825. CGE)

Figures 55 and 56

L. lignipes Heller, *Muhlenbergia* 8: 66, Fig. 8. 1912. (Type: Eugene, Lane Co., Oregon, *Heller* 10042 RENO, POM, MIN)

Common Name: Riverbank Lupine.

Plants perennial from a branched caudex, herbaceous, the top dying back annually, the surviving portion of the stem lying prostrate with the new growth, weak but ascending to 4-6 dm tall, appearing glabrous to the unaided eye; internodes slightly longer than the petioles and the petioles generally shorter than the leaflets, the lateral buds producing several more or less fasciculate leaves; leaflets 6-9, narrowly oblanceolate, glabrous above, thinly, minutely pubescent beneath, the largest 2.5-5 cm long and 5-13 mm wide, rounded to obtuse and mucronate; peduncles 5-9 cm long; racemes 12-25 cm long, commonly with 5-8 verticils, these 2.5-3.5 cm distant; bracts subulate, caducous or tardily 7-12 mm long; pedicels 6-10 mm long; calyx gibbous at base above, the upper lip bifid, the lower 6-8 mm long, somewhat boat-shaped; banner orbicular, glabrous, reflexed at the midpoint; wings glabrous, 13-16 mm long, 7-10 mm wide; keel ciliate the entire length of the upper margin, densest toward the acumen; pods to 5 cm long and 7.5-8 mm wide, minutely pubescent on the sides, finely hispidulous on the margins. No map.

Occurring in the valleys of western Oregon and the lowland of Washington west of the Cascade Mts. It has been found as far north as Island Co., Washington, and in southwestern B.C.

The description is largely from the original Douglas type material, supplemented by data from current collections of Gillett and others. The closest relative of this taxon is *L. arboreus*.

Material of this species from northern California is rather atypical. Introgression with *L. albigifrons* Benth, and *L. arboreus* Sims is indicated by several characters. Flowering in July. This species is known in Canada from Sooke, Vancouver Island, B.C., *Anderson*, 14 May 1926 (V).

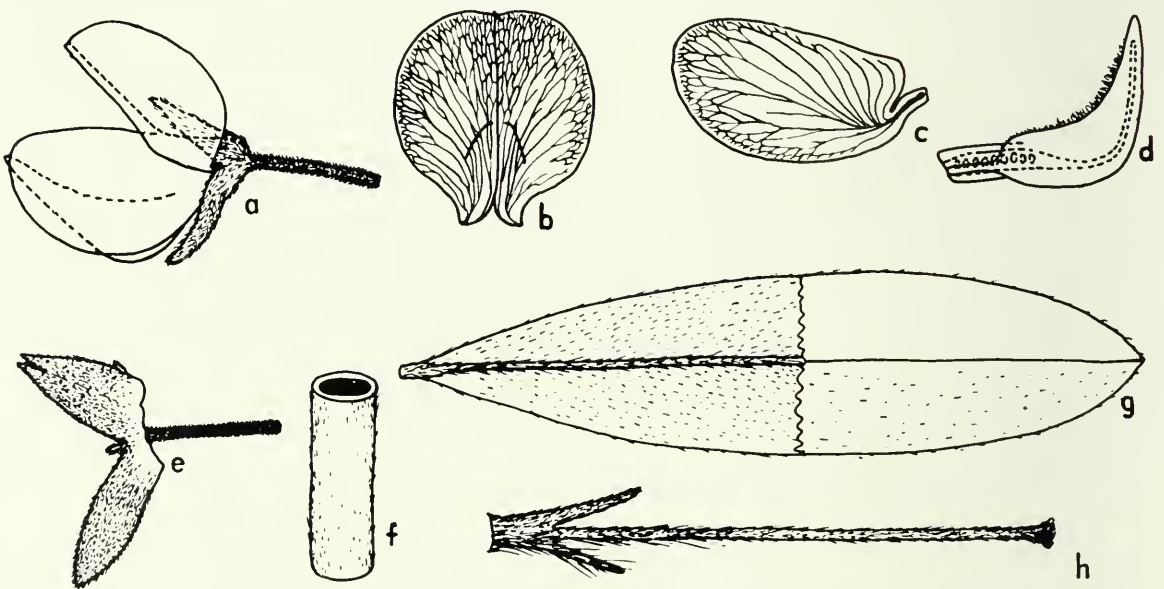


Figure 56. *Lupinus rivularis* Dougl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem segment; (g) leaflet; (h) petiole and stipules (adaxial below)



BRITISH COLUMBIA, CANADA
QUEEN CHARLOTTE ISLANDS

Lupinus littoralis Dougl.

About 4 miles north of mouth of Ooanda
River along east coast of Graham Island.

Rare, only a few scattered individuals
seen in stabilized driftwood zone.

No. 35865 J.A. Calder July 11, 1964
R.L. Taylor
Dept. of Agriculture, Ottawa, Canada

Figure 57. *Lupinus littoralis* Dougl.

23. **Lupinus littoralis** Dougl. in Lindl., Bot. Reg. 14: t. 1198. 1828. (Type: NW coast of N. America, *Douglas*, 1825, CGE)

Figures 57 to 59

Common Name: Seashore Lupine, Chinook Licorice.

Plants perennial, herbaceous, prostrate in mats; roots reported to be yellow when fresh; commonly with long pilose spreading hairs; stems slender 2-3 mm in diameter, minutely appressed strigose; petioles 2-4 cm long, strigose; stipules subulate, attenuate, those of primary leaves connate, 3-5 mm, about $\frac{1}{3}$ their length; leaflets 6-8, linear-oblongate, the largest 1.3-2.5 cm long, 3.5-6 mm wide, obtuse to rounded mucronate, generally glabrous or glabrate above; peduncles 3.5-5.5 cm long; racemes to 10 cm in flower and 15 cm in fruit, usually verticillate, the lower verticils to 4 cm distant; bracts subulate-attenuate, to 15 mm long; pedicels 3-5 mm long, ascending hispidulous; calyx finely silky-sericeous, the lips 4-5.5 mm long, the lower broad, as in *L. arboreus*, but not deflexed nor boatlike; corolla 11-13 mm long; banner suborbicular, pale blue, lavender to white, reflexed at or below the midpoint; wings bright blue to purplish; keel finely ciliate along the distal half of the upper margin and papillate above the claws; pods 3.0-3.8 cm long, 6-6.5 mm wide, sparsely strigose; ovules 10-12, oblique as in *L. arboreus*; seeds 3 mm long, 1.5 mm wide, finely mottled.

Commonly found on the upper part of the beach sand in the strand vegetation or on dune material slightly inland, from Mendocina County, California, northward to the channel side of the Queen Charlotte Islands, B.C. Flowering May to July.

Occasional plants with lanate hairs and a somewhat inflated hollow stem suggest introgression from *L. nootkatensis*.

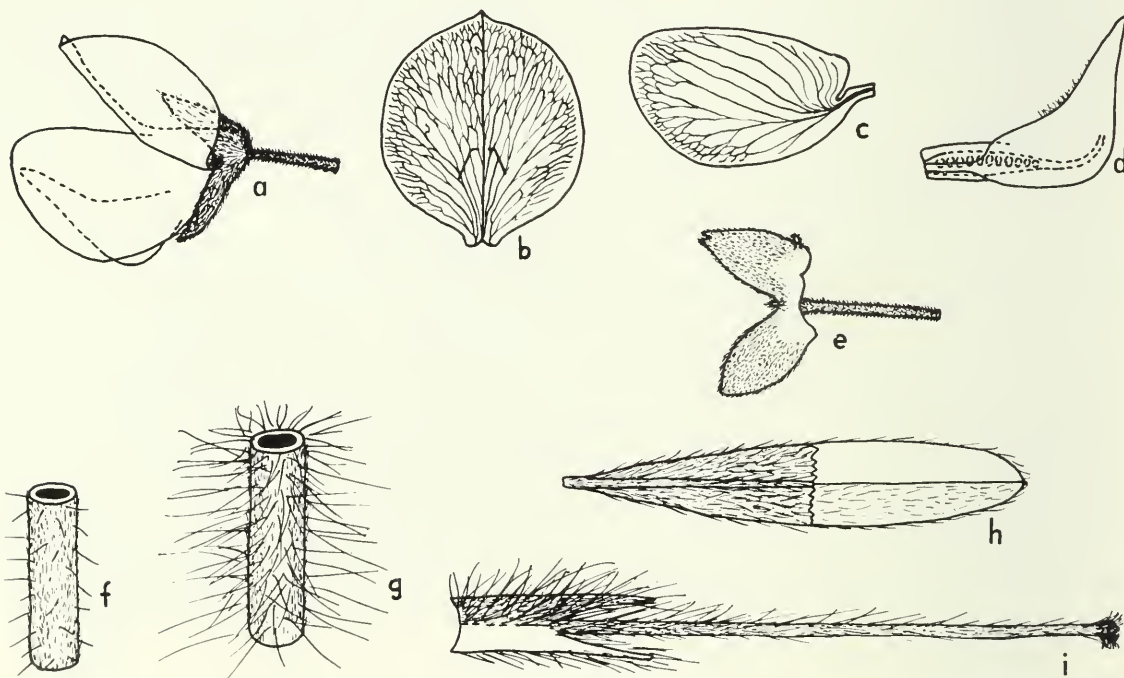


Figure 58. *Lupinus littoralis* Dougl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f and g) stem segments, showing variation in thickness and pubescence; (h) leaflet; (i) petiole and stipules

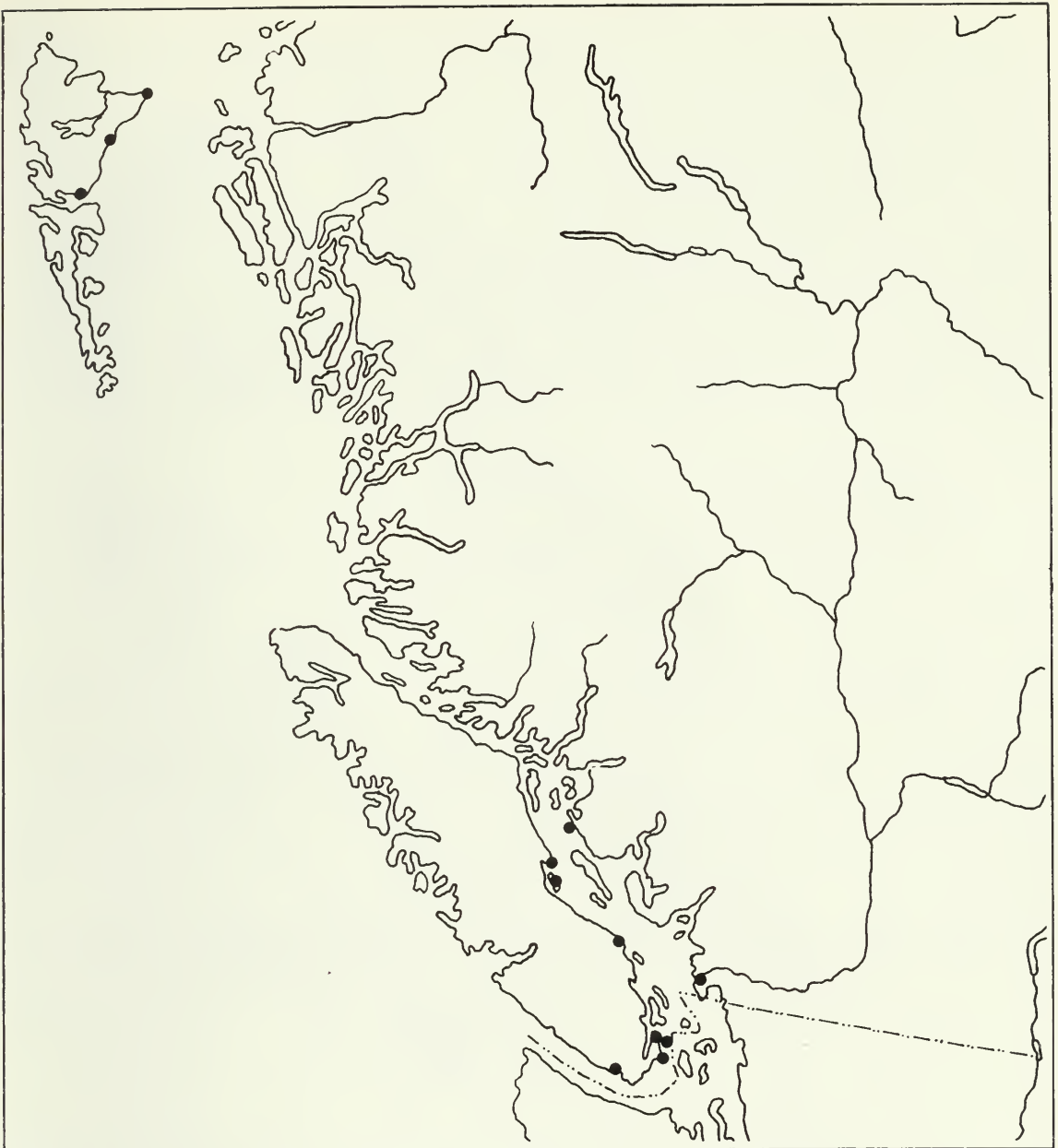


Figure 59. Distribution of *Lupinus littoralis* Dougl. in British Columbia

24a. *Lupinus perennis* L. var. *perennis*, Sp. Pl. 2: 721. 1753. (Type: Virginia, Clayton BM, photograph GH)

Figures 60 to 62

L. perennis L. f. *leucanthus* Fern., Rhod. 45: 356. 1943. (Type: New Medford, Conn., Eames 11401, GH)

L. perennis L. f. *bicolor* Farwell, Am. Midl. Nat. 12: 123. 1930. (Type: Ortonville, Mich., Farwell 8192, 23 May 1928, MICH)

L. perennis L. f. *rosea* Britton, Bull. Torrey Club 17: 124. 1890. (Type: May's Landing, Atlantic Co., N.J., Peters, NY)

Common Name: Wild Lupine.

Plants perennial, 3-5 or 6 dm tall; stems 3-5 mm in diameter, hollow, forming clumps from rhizomatous or branching underground stems, minutely appressed



Figure 60. *Lupinus perennis* L.

puberulent, with some scattered appressed or ascending hairs 1-1.5 mm long (the latter abundant and spreading in var. *occidentalis*); petioles longest from the 3rd to the 5th node, shorter in both directions, the longest 6-9 cm long, pubescence similar to that of the stem; stipules longest near the base of the plant, fused to the petiole of the 2nd or 3rd node for 4-11 mm, the upper ones only connate for about 2 mm, the free portion setaceous, 2-8 mm long, shortest above; leaflets 7-10, oblanceolate, the largest, 3-3.8 cm long, 7-12 mm wide, rounded mucronate, glabrous above, appressed strigose beneath; peduncles 4-9 cm long; racemes 10-20 cm long, with the upper flowers still not open; flowers scattered or subverticillate; bracts subulate, attenuate, 4-6 mm long; pedicels 5-7 mm long at anthesis, pubescence spreading hispidulous, 0.2-0.4 mm long; calyx thinly sericeous, the upper lip 4-4.8 mm long, incised 0.4-1.4 mm, rarely more, gibbous at the base, the lower lip 5-5.8 mm long, slightly tridentate at the tip, both lips glabrous within, except for pubescence toward

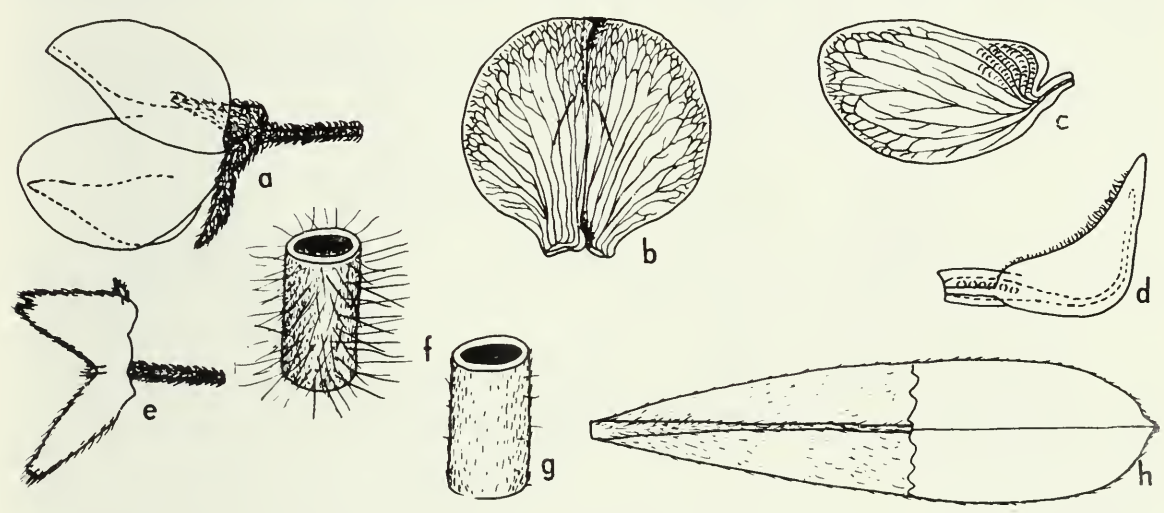


Figure 61. *Lupinus perennis* L. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) stem of var. *occidentalis* S. Wats.; (g) stem of var. *perennis*; (h) leaflet

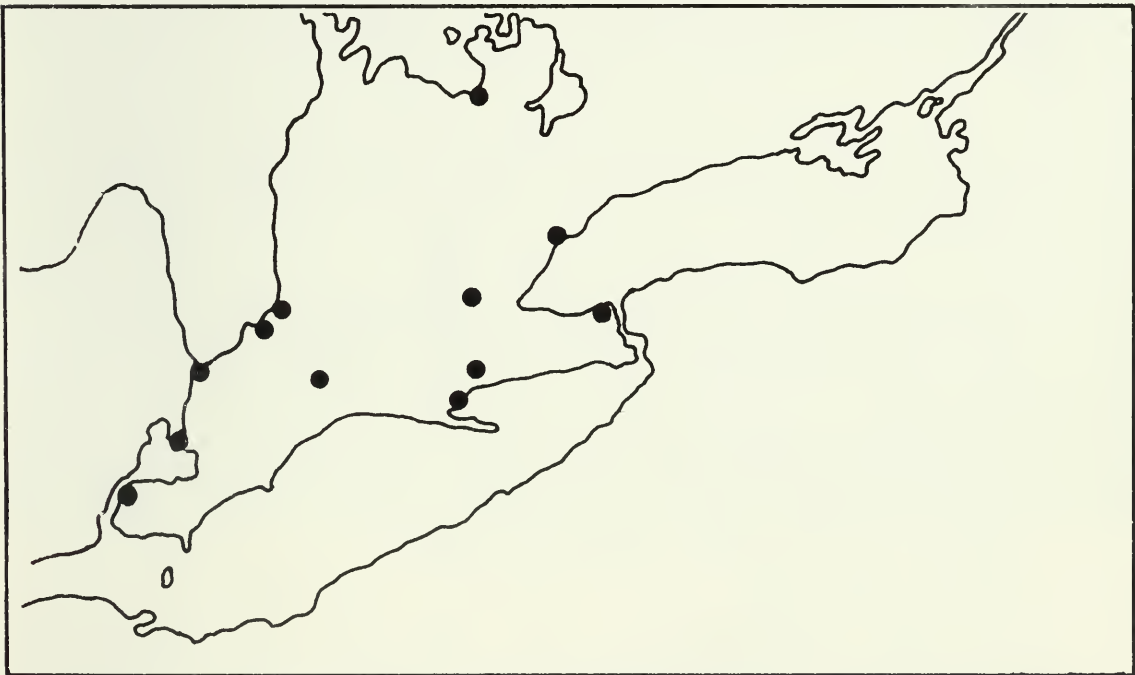


Figure 62. Distribution of *L. perennis* L. in Ontario

the tips; banner glabrous, orbicular, 10.5-13 mm long, 10.7-14 mm wide (l/w ratio 0.96), with a short gibbous claw, the sulcus 1.8-2.6 mm deep; wings glabrous, 12-14 mm long, 6-9 mm wide; keel av. 3.9 mm wide at the angle, the angle 87°-108°, av. 95.3°, ciliate generally along the entire upper margins, sometimes along the claws also, longest hairs towards the acumen; ovules 5-6; pods strigose, sometimes coarsely so, 30-40 mm long, 8-9 mm wide at maturity.

Lupinus perennis follows the coastal plain from Georgia northward to Canada and westward in the Great Lakes area to central Minnesota always in sandy soils from rivers, or glacial outwash. The habitat along the eastern drainage of the Appalachian Mountains is river benches or other sandy sites.

In Canada all but a few collections are the spreading pilose to hirsute variety *occidentalis* Watson. The two varieties are sympatric over much of their range but in some areas may be largely one or the other variety. Flowering in Canada from May to June.

A few hybrids have been found with the west coast *L. polyphyllus* Lindl. and the Alaskan *L. nootkatensis* Donn, where the latter two are adventive in Nova Scotia and Prince Edward Island.

- 24b. ***Lupinus perennis* L. var. *occidentalis* S. Wats., Proc. Am. Acad. 8: 526. 1873.**
(Type: Watson cited Michigan and Wisconsin localities but no specimen)

L. perennis L. f. *albiracemus* A. H. Moore, Rhod. 16: 129. 1914. (Type: West Toronto Junction, Ontario, W. Brodie, 3 June 1893, US)

L. perennis L. var. *occidentalis* S. Wats. f. *albiracemus* (A. H. Moore) Fern., Rhod. 45: 356. 1943.

Lupinus perennis var. *occidentalis* differs from var. *perennis* by the usually abundant spreading pilose to hirsute hairs on stems and petioles. The floral size and conformation are similar to var. *perennis*. Var. *occidentalis* is far more abundant and is dispersed throughout the greater portion of the range of subspecies *perennis*. Variety *occidentalis* is probably the result of only a few gene differences.

- 25a. ***Lupinus arcticus* S. Wats. subsp. *arcticus*, Proc. Am. Acad. 8: 526. 1873.**
(Lectotype: designated by W. W. Eggleston, (Great) Bear Lake, Richardson GH)

Figures 63 and 64

L. nootkatensis Donn var. *Kjellmannii* Cof. Vidensk-Selsk. Skr., Math.-Naturv. Kl. 8. 1910. (Type: King Point, Yukon, Ostenfeld, 1908, isotype CAN)

L. gakonensis C. P. Smith, Sp. Lup. 649, 1949. (Type: Gakona, Alaska, Anderson 8532, ISC)

L. multicaulis C. P. Smith, loc. cit. 649. 1949. (Type: Glenn Highway, Alaska, Anderson in 1944, ISC)

L. donnellyensis C. P. Smith, loc. cit. 654. 1949. Type: Donnelly Dome, Richardson Highway, mile 253, Alaska, Anderson 2281, ISC)

L. multifolius C. P. Smith, loc. cit. 660. 1949. (Type: Kluane Lake, Yukon, Anderson 9449, ISC)

L. borealis Heller, Muhlenbergia 8: 82. 1912. (Type: Rink Rapids, Klondike River, Yukon, Macoun 58426, RENO)

L. relictus A. Nels. in Hultén, Fl. Alaska & Yukon 7: 1074. 1946, pro syn. (NY)

1832
 1832
 1832

9
 10
 11
 12



PLANTS OF YUKON TERRITORY, CANADA (4)
 lupinus arcticus
 Plant over 100 ft.
 as were blue, common.
 This species is found in the
 river.
 140 J. 101-11
 DIVISION OF BOTANY, BUREAU SERVICE
 DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

Figure 63. *Lupinus arcticus* S. Wats. subsp. *arcticus*

L. polyphyllus Lindl. subsp. *arcticus* (S. Wats.) Phillips, Res. Stud. St. Coll. Wash. **23**: 181. 1955.

L. toklatensis A. Nels., Am. Jour. Bot. **32**: 288. 1945. (Type: Toklat area, Mile 56, Mt. McKinley Park, Alaska, A. & R. Nelson 3568, RM, US)

L. yukonensis Greene, Leaflet Bot. Obs. & Crit. **2**: 233. 1912. (Type: Klondike River, Yukon, Macoun, 9 July 1902, isotype CAN)

Common Name: Arctic Lupine.

Plants perennial, dying back to a branched woody caudex annually; stems clustered, 2.0-4.0 dm tall at anthesis, pubescence thinly appressed silky-sericeous or with few to many spreading hairs, petioles of the early leaves very stunted at the most northerly latitudes, the longest on the new radicle shoots, these 9-14 cm long; flowering shoots developing from the radicle shoots of the previous year or earlier; leaflets 6-10, elliptic-oblongate, acute, glabrous above, thinly strigose below, to 9 cm long and 10-15 mm wide at maturity; peduncles 4-7 cm long, with racemes 5-8 cm long at anthesis and to 15 cm long in fruit, the verticils 3-7, 12-18 mm distant; bracts subpersistent to caducous, subulate-setaceous, 8-14 mm long; pedicels 4-6 mm long, filiform, with fine spreading pilose hairs, calyx strigose to villous, the lower lip 6.5-10.8 mm long, lanceolate, slender, the upper lip quite gibbous at the base, 4.7-8.2 mm long, the sinus bracteole 0.4-3.0 mm long; banner orbicular, 13.8-17.3 mm long and 13.8-19 mm wide, glabrous, reflexed slightly below the midpoint; wings 14.2-18.7 mm long, 7.2-9.0 mm wide, the keel angle 82° - 96° , glabrous or sparsely ciliate towards the acumen; mature pods to 4.3 cm long, to 9 mm wide, silky-pilose to lanate, with 5-8 ovules.

Lupinus arcticus subsp. *arcticus* grows on drained hummocks of the Arctic tundra and in forest clearings north of the Arctic Circle, ranging southward into northern British Columbia.

The area of contact with subspecies *subalpinus* (Piper & Rob.) Dunn is inadequately collected. However, some specimens from Alaska and northern British Columbia appear to be reasonably typical *subalpinus*, while others are difficult to

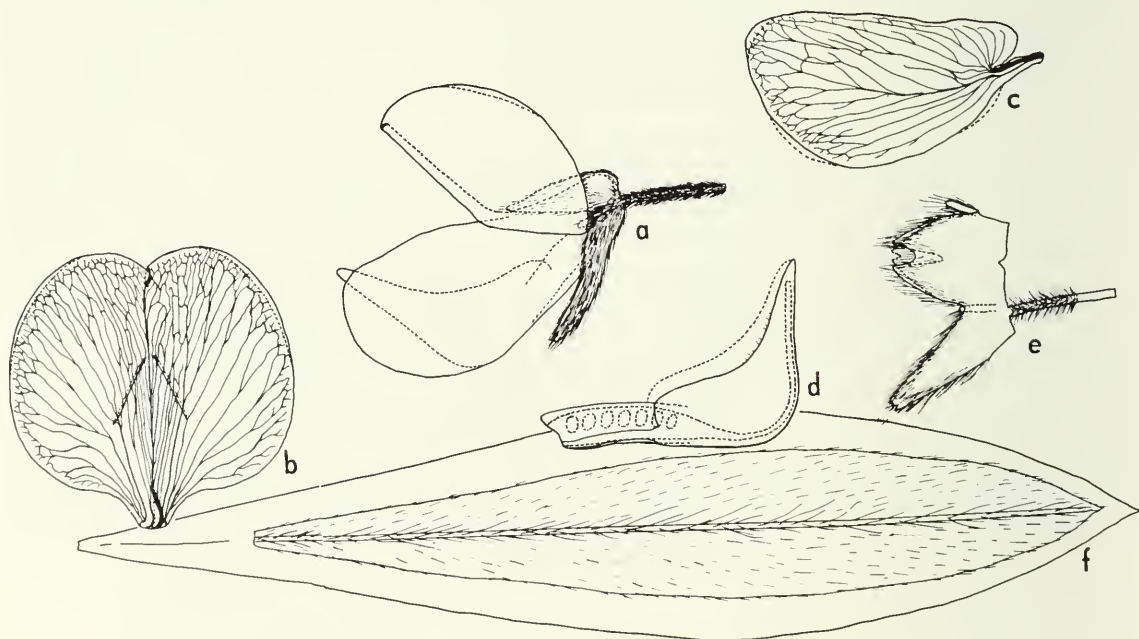


Figure 64. *Lupinus arcticus* S. Wats. subsp. *arcticus* (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx, showing gibbous base of upper lip; (f) leaflet superimposed on one of *L. polyphyllus* Lindl.



Figure 65. *Lupinus arcticus* S. Wats. subsp. *subalpinus*

place. *Lupinus arcticus* hybridizes readily with *L. kuschei* Eastw. and possibly with *L. sericeus* Pursh. There is also a close relationship between *L. arcticus* and *L. perennis* L.

25b. *Lupinus arcticus* S. Wats. subsp. **subalpinus** (Piper & Rob.) Dunn, Madroño 18: 16. 1965.

Figures 65 and 66

L. subalpinus Piper & Rob., Contr. U.S. Nat. Herb. 11: 356. 1906. (Type: Cascade Mts. to Fort Colville. *Lyall in 1860*, GH)

L. latifolius Agardh. var. *subalpinus* (Piper & Rob.) C. P. Smith, Bull. Torrey Club 51: 308. 1924.

L. arcticus S. Wats. var. *subalpinus* (Piper & Rob.) C. P. Smith in Abrams, Fl. Pac. States 2: 518. 1944.

L. glacialis C. P. Smith, Sp. Lup. 236. 1940. (Type: Big Four, Okanogan Co., Wash., *Thompson 14705* DS, isotype MO)

L. volcanicus Greene var. *rupestricola* C. P. Smith, loc. cit. 236. 1940. (Type: Goat Rocks, Cascade Mts., Lewis Co., Wash., *Thompson 15210*, DS)

Plants herbaceous, perennial, 2.5-6 dm tall, several slender hollow stems from a rootstalk or branched caudex; stems commonly 2.5 mm in diameter, often appearing glabrous to the unaided eye, with appressed puberulence and scattered ascending hairs 1 mm long; leaves all cauline at anthesis, 4-6 nodes with functional leaves, basal leaves withered, dwarfed or caducous by anthesis; longest petioles on the second to the fourth functional leaf at anthesis, these 5-9 cm long, gradated upward to only 3-4 cm long; stipules setaceous, the longest on the largest leaves, these 10-12 mm, connate for 2-4 mm; leaflets 6-8, oblanceolate, mucronate, rounded to obtuse at maturity, glabrous above or occasionally sparsely strigose, strigose beneath, the largest 4-5.5 cm long and 9-14 mm wide; peduncles 4-8 cm long; racemes commonly 10-15 cm long, with 4-8 verticils or subverticillate; bracts subulate to setaceous, 4-6 mm long; pedicels, filiform, 6-8 mm long at anthesis; calyx subequal and subentire or the upper with a cleft to 5 mm deep, the lower lip

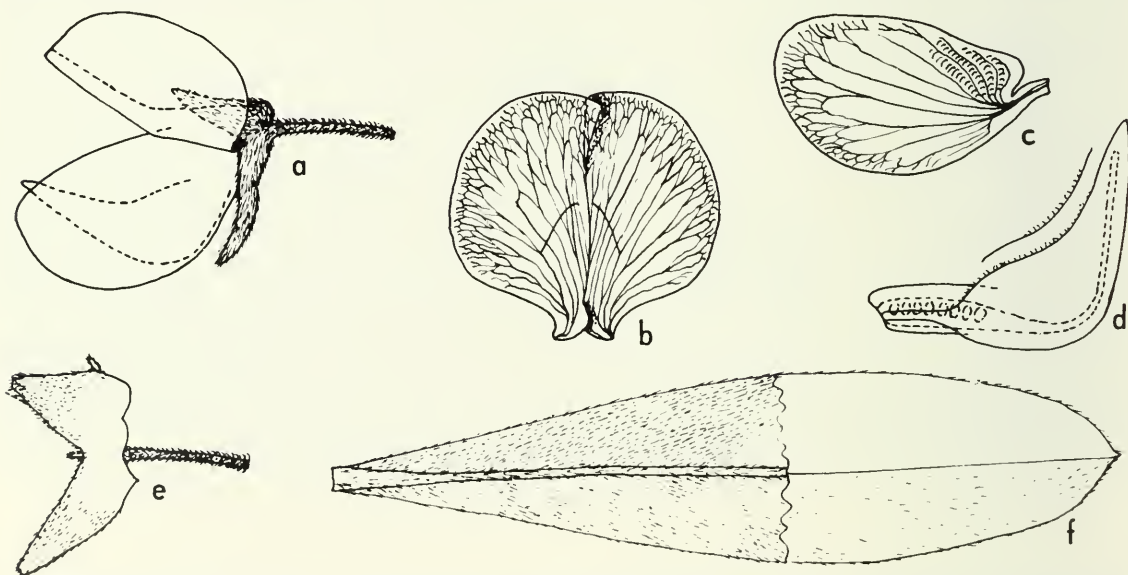


Figure 66. *Lupinus arcticus* S. Wats. subsp. *subalpinus* (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) leaflet

5-7 mm, the upper 4-6 mm; banner orbicular, glabrous, the tip emarginate, 11-15 mm wide and 10-14 mm long; wings normally glabrous, 12-17 mm long; keel arcuate, the angle 85°-95°, sparsely ciliate above for most of the length, usually densest and longest near the middle or above; ovules 6-8; pods not available.

Lupinus arcticus subsp. *subalpinus* is characterized by the consistently cauline leaves having blunt or rounded tips. The flowers are generally smaller than those of the species but essentially of the same conformation; the smallest occur in areas of montane Washington. Because of the broad latitudinal range extending as far south as the volcanic cones of northern Oregon, and the high montane, arctic-alpine habitat, this subspecies must require an entirely different physiological mechanism than the restricted subspecies *arcticus*. This subspecies hybridizes with *L. nootkatensis* Donn, *L. argenteus* Pursh and possibly others. It shows considerable morphological affinity with *L. rivularis* Dougl. which tends to occur at a considerably lower altitude, grading into *L. arcticus* subsp. *canadensis* (C. P. Smith) Dunn in much the same manner as the altitudinal taxa described for *Potentilla* by Clausen, Keck and Hiesey (1940).

25c. ***Lupinus arcticus* S. Wats. subsp. *canadensis* (C. P. Smith) Dunn, Leaflet. West. Bot. 10: 173. 1965.**

Figures 67 to 69

L. latifolius Agardh var. *canadensis* C. P. Smith, Bull. Torrey Club 51: 307. 1924.
(Type: Colwood, Vancouver Island, B.C., Newcombe, 24 June 1915, DS)

Plants herbaceous, perennial, from a rootstalk or branched caudex; stems rarely fistulose to 7 mm in diameter, generally only 3-5 mm, hispidulous to hispid with spreading hairs, sometimes subappressed; petioles of the lower leaves 8-12 cm long; pubescence similar to that of the stems but often denser, stipules weakly developed, the lower mostly connate to the petiole, the upper mostly free, subulate to filiform, frequently missing on the herbarium specimens, gradated 10-15 mm long below to 3-4 mm long above; leaflets 6-9, oblanceolate, acute to obtuse or rounded but mucronate, strigose to hispidulous above and strigose to pilose below, the midvein more densely hairy, 4-9 cm long, 1.0-2.5 cm wide; peduncles slender, 3-6 cm at anthesis, to 10 cm in fruit; racemes 7-15 cm long; flowers scattered to subverticillate; bracts subulate, 5-7 mm long, caducous to tardily deciduous; pedicels 5-8 mm long at anthesis, hispidulous; calyx sericeous, both inside and out; lower lip lanceolate, 5-7.5 mm long, entire to faintly notched at the tip, upper lip 4-5.5 mm long, with a slight notch at the tip, slightly gibbous at the base; banner suborbicular, 10-11 mm long, reflexed near the midpoint; wings obovate, 11-13 mm long, keel ciliate on the upper edge above the claws, papillose below the claws, the distal half above generally glabrous; pods 2.0-3.5 cm long, 7-8 mm wide, strigose to thinly sericeous; ovules 5-7.

This taxon occurs mainly on Vancouver Island and in the Puget Sound area. On the mainland typical material has been found in the Lillooet and Yale areas, and hybrids occur with *L. arcticus* subsp. *subalpinus* on Mt. Cheam. Several specimens from this area show evidence of introgression because of the occurrence of strigose hairs on the upper leaflet surface. We suggest that the hispidulous pubescence of the stem of *L. arcticus* subsp. *canadensis* is probably a character derived from *L. polyphyllus* Lindl. var. *pallidipes* (Heller) C. P. Smith, or *L. littoralis* Dougl. in Lindl., which also has the keel ciliation necessary, and the short inflorescence is probably derived from *L. arcticus* subsp. *subalpinus*. Flowering from May through July.



PLANTS OF BRITISH COLUMBIA, CANADA (5)

BOTANY DIVISION, SCIENCE SERVICE
 DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA
 NA 413
 1891-15M-284

Figure 67. *Lupinus arcticus* S. Wats, subsp. *canadensis* (C. P. Smith) Dunn

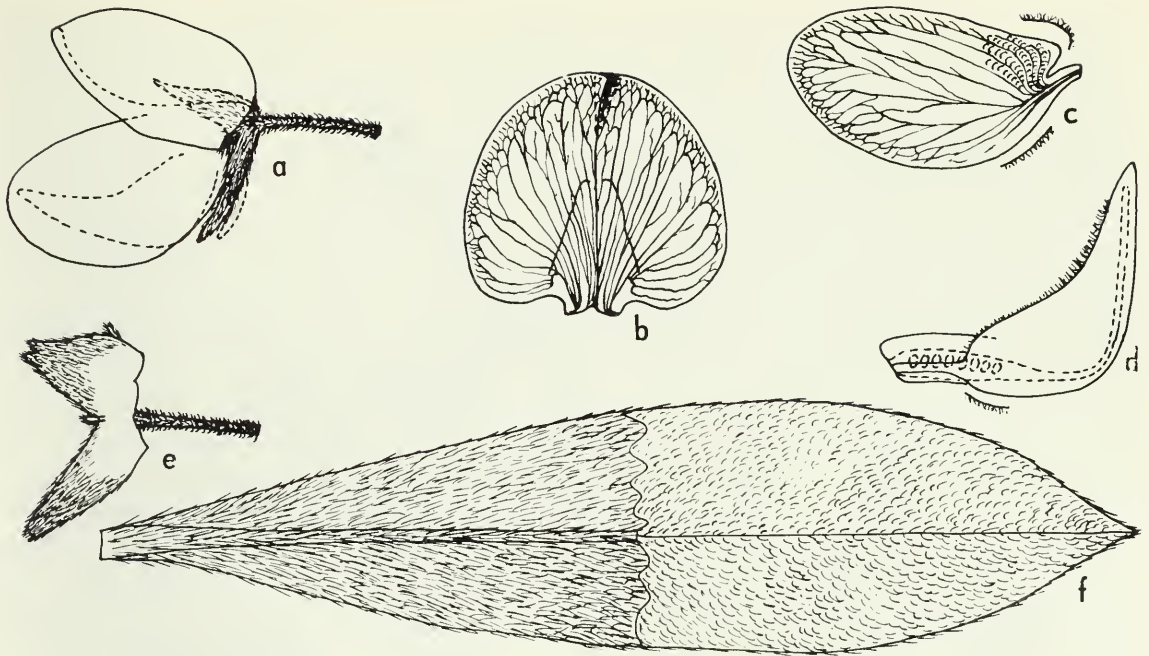


Figure 68. *Lupinus arcticus* S. Wats. subsp. *canadensis* (C. P. Smith) Dunn (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) leaflet

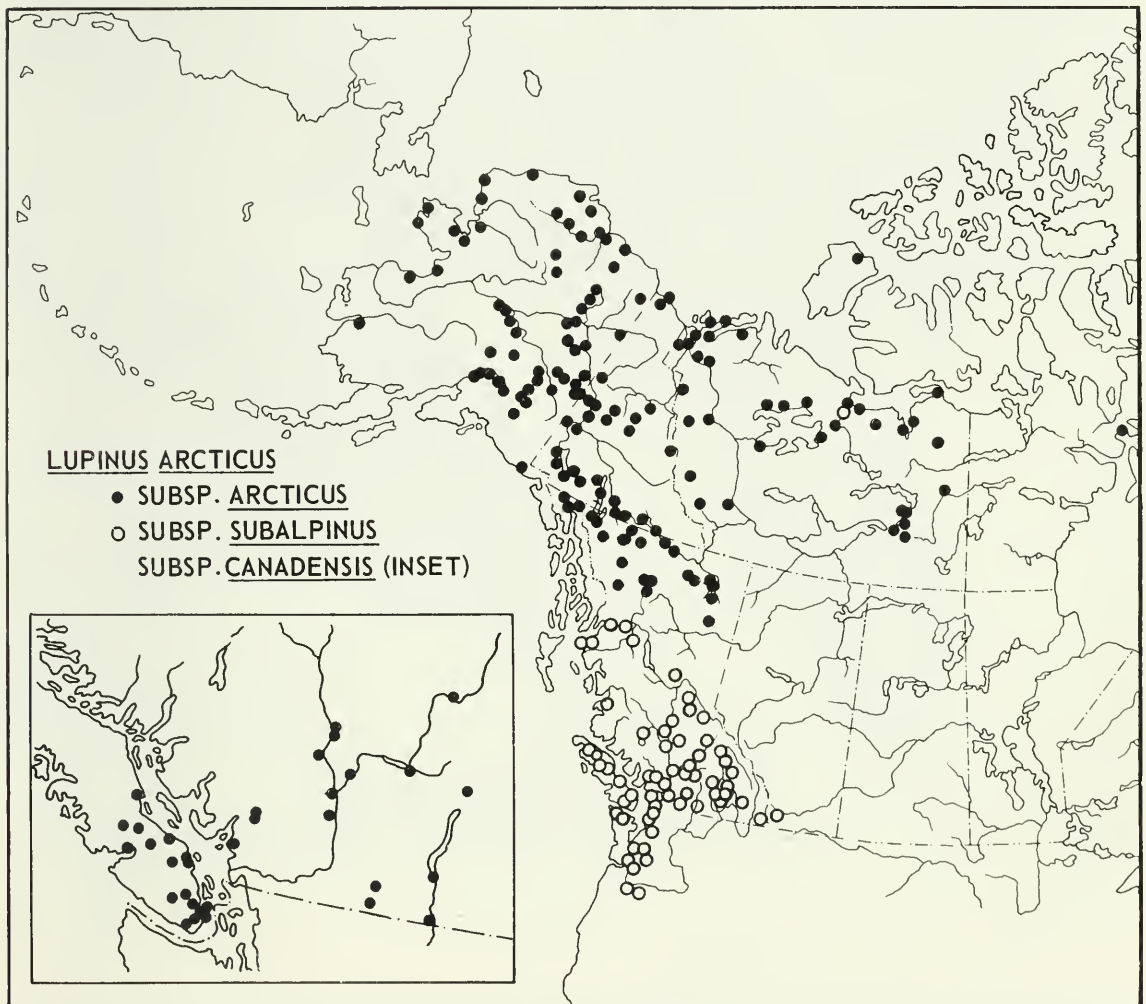


Figure 69. Distribution of *Lupinus arcticus* S. Wats.

DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA
DIVISION OF BOTANY, SCIENCE SERVICE
FORM 50-1-1
(1914, M.C. 1915)
NAME *Lupinus nootkatensis*

1934

LOCALITY

HABITAT

DESCRIPTION



PLANTS OF ALASKA

U.S. DEPT. OF AGRICULTURE
DIVISION OF BOTANY

Figure 70. *Lupinus nootkatensis* Donn var. *nootkatensis*

26a. *Lupinus nootkatensis* Donn in Sims var. *nootkatensis*, Bot. Mag. 32: t. 1311. 1810.

Figures 70 to 72

L. kiskensis C. P. Smith, Sp. Lup. 470. 1945. (Type: Loven Hill, Kiska Island, Alaska, McDonald C-409, US 1874080)

L. trifurcatus C. P. Smith, loc. cit. 577. 1948. (Type: Jasper House, Rocky Mts., Alberta, Burke, K)

L. albertensis C. P. Smith, loc. cit. 578. 1948. (Type: east side Rocky Mts., Burke, K)

L. nootkatensis Donn var. *ethel-looffiae* C. P. Smith, loc. cit. 653. 1949. (Type: Alitak, Alaska, E. & H. Looff 125, DS, isotypes GH, MO, intergrades to var. *fruticosus* Sims)

L. nootkatensis Donn, var. *henry-looffii* C. P. Smith, loc. cit. 653. 1949. (Type: Olga Bay, Alaska, E. & H. Looff 667, DS)

L. nootkatensis Donn var. *perlanatus* C. P. Smith, loc. cit. 655. 1949. (Type: St. Paul Island, Alaska, Anderson 4035, ISC)

L. nootkatensis Donn. f. *leucanthus* Lepage, Am. Midl. Nat. 46: 758. 1951. (Type: Kodiak, nr Buskin Lake, Alaska, Lepage 25223, LCU, not seen)

L. perennis L. subsp. *nootkatensis* (Donn in Sims) Phillips, Res. Stud. St. Coll. Wash. 23: 175. 1955.

Common Name: Nootka Lupine.

Plants perennial, dying back annually to a subterranean woody caudex; stems 4-10 dm tall in favorable locations and barely 10 cm in areas of severe exposure, the larger quite fistulose, 1-1.5 cm in diameter with abundant pilose, spreading hairs, sparser by sloughing in age; petioles all cauline, 2-10 cm long, seldom twice as long as the leaflets; stipules on the lower abnormal leaves up to 6 cm long, on the upper 1.5-2.5 cm long, woolly with pilose hairs up to 4 mm long; leaflets 5-8,

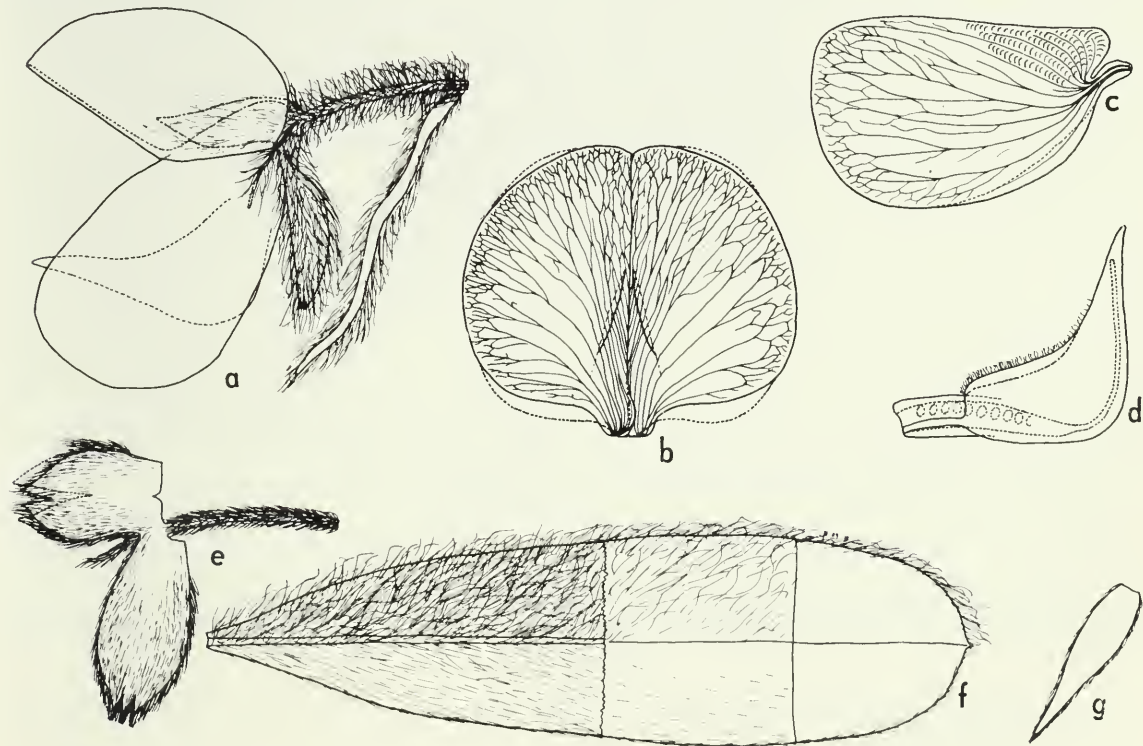


Figure 71. *Lupinus nootkatensis* Donn var. *nootkatensis* (a) flower, showing linear-attenuate bract; (b) banner; (c) wing; (d) keel; and var. *fruticosus* Sims (e) calyx; (f) leaflet, lower half (the upper half illustrates the variation in var. *nootkatensis*); (g) bract

broadly oblanceolate, rounded, shaggy villous below and generally glabrous above but sparsely near the margins above in about 30 percent of the specimens seen; largest leaflets 1.8-6.5 cm long, 4-16 mm wide; peduncles 1-9 cm long with racemes generally 2-10 cm, occasionally to 30 cm long, 1-15 verticils, generally less than 10, 15-35 mm distant at anthesis; pedicels 7-13 mm long, in the axils of filiform bracts 16-19 mm long; lower calyx lip 7.6-11.5 mm long, broad, boat-shaped, bent backwards, deeply toothed, woolly without and sericeous over most of the inside; bracteole at the sinus between the upper and lower calyx lips filiform, 1.7-5.0 mm long; banner 12.5-19 mm long, 14.0-21.4 mm wide, widest below the middle, reflexed below the midpoint, the sulcus to 2.7 mm deep in the middle; wings 14-20 mm long; keel 4-6 mm wide in the middle, the angle about 90°; pods 5-6 cm long, 10-12 mm wide, lanate when immature but sericeous in age; ovules 7-11.

The habitat of this species is essentially maritime along coastal Alaska, British Columbia and the Aleutian chain, reaching Attu Island. Although *L. nootkatensis* is the most westerly occurring species of the western hemisphere, it does not occur in Asia and no species of *Lupinus* has ever been reported as occurring naturally there. On the Atlantic coast it has been introduced into Nova Scotia and Newfoundland. *L. nootkatensis* is related to the *L. arboreus-rivularis-latifolius* complex or complexes, and bears a remarkable morphological similarity to the commercial *L. hartwegii*, an annual.



Figure 72. Distribution of *Lupinus nootkatensis* Donn

26b. *Lupinus nootkatensis* Donn var. *fruticosus* Sims, Bot. Mag. 47: t. 2136. 1820.

Figure 71

L. nootkatensis Donn β *glaber* Hook., Fl. Bor. Am. 1: 163. 1834. (Type: Based on Bot. Mag. t. 2136)

L. arboreus Sims var. *fruticosus* (Sims) S. Wats., Proc. Am. Acad. 8: 524. 1873.

L. nootkatensis Donn var. *unalaskensis* S. Wats., Proc. Am. Acad. 8: 524. 1873.
(Type: Harrington in 1871, GH)



PLANTS OF BRITISH COLUMBIA, CANADA

Lupinus polyphyllus Lindl.
det. D. C. S. 1900

BOTANY DIVISION, SCIENCE SERVICE
DEPARTMENT OF AGRICULTURE, OTTAWA, CANADA

4-21
100-1000 X

Figure 73. *Lupinus polyphyllus* Lindl.

Stems more slender than var. *nootkatensis*, the primary hollow, to 6-7 mm in diameter, the upper branches 1.5-2.5 mm in diameter, finely appressed silky-sericeous throughout except the upper surface of the leaflets which are generally glabrous over about one third with sparse strigose hairs near the margin; stipules shorter than those of the species and sericeous; bracts 7-13 mm long, sericeous, generally flat and subulate to lanceolate; lower calyx-lip the same shape but with smaller teeth and sericeous on both sides, as also the upper lip; bracteoles at the lateral sinus of the calyx shorter and sericeous. Otherwise the flower structure is not distinct from that of the species.

The variety is completely sympatric with the species, apparently cropping out intermittently.

27a. ***Lupinus polyphyllus* Lindl. var. *polyphyllus***, Bot. Reg. 13: t. 1096. 1827. (Type: *Douglas 116*, CGE, see Dunn 1956)

Figures 73 to 75

L. grandifolius Lindl. in Agardh, Syn. Gen. Lup. 18, 1835. (Type: California, *Douglas*, CGE)

L. magnus Greene, Pittonia 3: 160. 1897. (Type: not seen, but material identified by Greene in the 1890's seen at UC, JEP)

L. matanuskensis C. P. Smith, Sp. Lup. 651. 1949. (Type: Matanuska, Alaska, *Anderson 945*, ISC)

L. pseudopolyphyllus C. P. Smith, loc. cit. 650. 1949. (Type: Moose Pass between Seward and Anchorage, Alaska, *Anderson 6825*, ISC, shows introgression from *L. nootkatensis*)

Common Name: Large-leaved Lupine.

Herbaceous perennials with fistulose stems from a branched caudex, new shoots sometimes arising several inches from the old stem, clumped but sub-rhizomatous; stems generally unbranched, 5-15 dm high, glabrate but sometimes pilose to hirsute hairs present (introgression), with a minute appressed puberulent undercoat, generally 3-5 cauline nodes; several basal petioles from 1.4-6.2 dm long, the upper cauline 6-10 cm long; stipules gradated from 3.5 cm long below to 1 cm above, connate for all but 3-7 mm; leaflets 10-17, elliptic-oblongate, acute to acuminate, the largest 5.5-12 cm long, 10-22 mm wide, glabrous above,

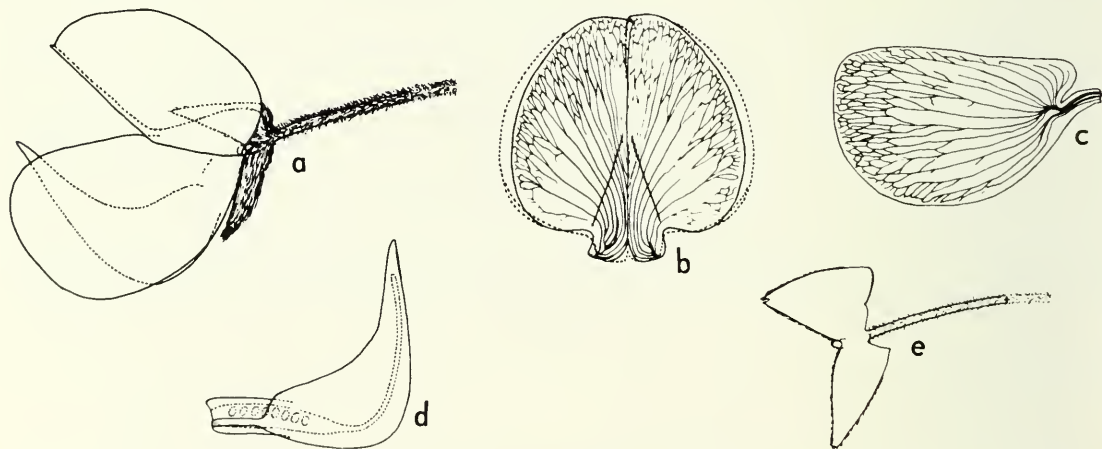


Figure 74. *Lupinus polyphyllus* Lindl. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx

sparsely strigose below; racemes 18-40 cm long, on peduncles 4-14 cm long, verticillate or occasionally scattered, the verticils 10-12 mm distant at anthesis; bracts caducous, subulate to lanceolate, 10-13 mm long; pedicels filiform, 5.4-9.4 mm long, spreading to ascending, spreading hispidulous; calyx sericeous to puberulent, the lips nearly equal, 3.6-7.5 mm long, both entire or with minute teeth, bracteole at the sinus 0.4-7.5 mm long; corolla glabrous; banner, 11.6-14.8 mm long, 9.6-14.0 mm wide, reflexed at the midpoint, the sulcus 2.1 mm deep midway; wings 12.0-15.7 mm long; keel ca. 4.0 mm wide in the middle with a slender falcate acumen, keel angle 68°-90°; legume arcuate 28-50 mm long, 8-10 mm wide, densely lanate with hairs 2-3.5 mm long; ovules 6-10.

Common in such native habitats as seashores, riverbanks, creekbeds and meadows in western Canada and Alaska but also found in disturbed habitats. Exclusively in disturbed habitats in eastern Canada, often escaping from cultivation. Flowering from mid-June until early September.

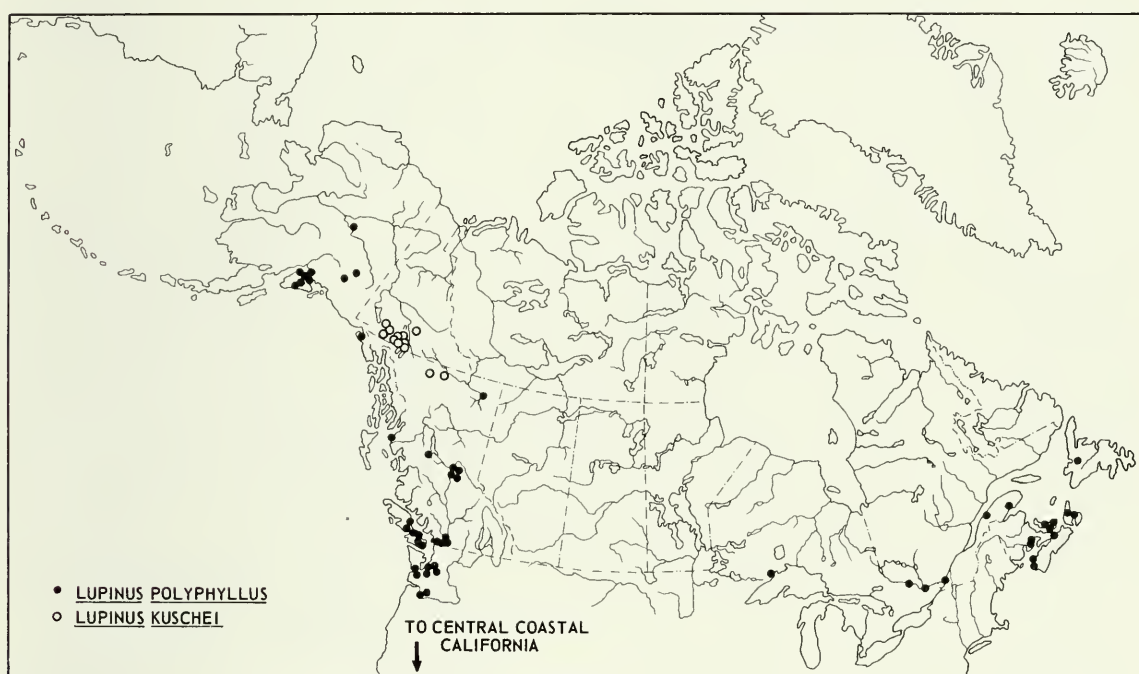


Figure 75. Distribution of *Lupinus polyphyllus* Lindl. (solid dots) and *L. kuschei* Eastw. (open circles)

27b. *Lupinus polyphyllus* Lindl. var. **pallidipes** (Heller) C. P. Smith, Contr. Dudley Herb., 1: 42. 1927.

L. pallidipes Heller, Muhlenbergia 7: 91. 1911. (Type: Eugene, Lane Co., Oregon. Heller 10041, 18 May 1910, RENO)

Plants 4-12 dm tall, the stems generally fistulose, 8-10 cm in diameter with spreading to retrorse pilose hairs 1-3 mm long, these sparse to dense; the lower petioles to 3.8 dm, commonly 1.5-2.0 dm long; stipules gradated from 3.0-1.3 cm, the longest basal; leaflets 12-16, elliptic-oblongate, acute, mucronate, thinly to abundantly strigose above and pilose below, rather densely so on the midvein, the largest leaflets 3-12 cm long, 8-25 mm wide; peduncles 3-10 cm long; racemes 1.5-3.0 dm long, the flowers scattered, dense; bracts caducous, lanceolate, 1 cm



Figure 76. *Lupinus burkei* S. Wats.

long or more; pedicels 7-12 mm long at anthesis; flowers as in var. *polyphyllus* except the keel papillose above the claws and sometimes sparsely ciliate toward the acumen; pods not seen.

This taxon was described from western Oregon, and is reported by Hitchcock for western Washington. The material on Vancouver Island appears to be identical. Thus far it is known in Canada only on Vancouver Island. There it is sympatric with var. *polyphyllus* and plants of both varieties are sometimes included in the same collection. The habitat in British Columbia is lowland, wet meadows or stream banks in forest clearings. Flowering is from May through July.

28. **Lupinus burkei** S. Wats., Proc. Amer. Acad. 8: 524. 1873. (Type: "Snake Country" (Snake River), *Burke*, GH)

Figures 76 to 78

L. polyphyllus var. *burkei* (S. Wats.) Hitchc., Vasc. Pls. Pac. NW 3: 321. 1961.

Common Name: Burke's Lupine.

Perennial plants of wet meadows or stream sides; stems fistulose, several from a rootstalk dying back to ground level annually, 4.5-9 dm tall, glabrate, the hairs very sparse, appressed; leaves radicle and cauline, the latter commonly 3-4; the petioles gradated upward, radicle petioles 15-30 cm long; stipules of the lower leaves connate to petiole 12-18 mm, the upper subulate to 10-15 mm long but connate only 2-3 mm; leaflets 7-11, oblanceolate, mucronate, glabrous above, the largest 4-10 cm long and 12-20 mm wide, thinly strigose beneath; peduncles 7-15 cm long; racemes dense, 20 cm long or more at maturity; bracts generally lanceolate-attenuate, persistent, 10-15 mm long; pedicels 2-3 mm long, in the north 4-5 mm; calyx lips very thin, almost transparent, the upper 4-5 mm long, bifid, the lower 5-7 mm long, slender, nearly entire, both finely silky-villous to sericeous; corolla bright blue, commonly glabrous but the keel occasionally with some cilia midway on the upper margin; the banner with a white to yellowish center, reflexed near the midpoint; pods densely lanate.

Lupinus burkei is most distinctive in the southern part of its range in Wyoming

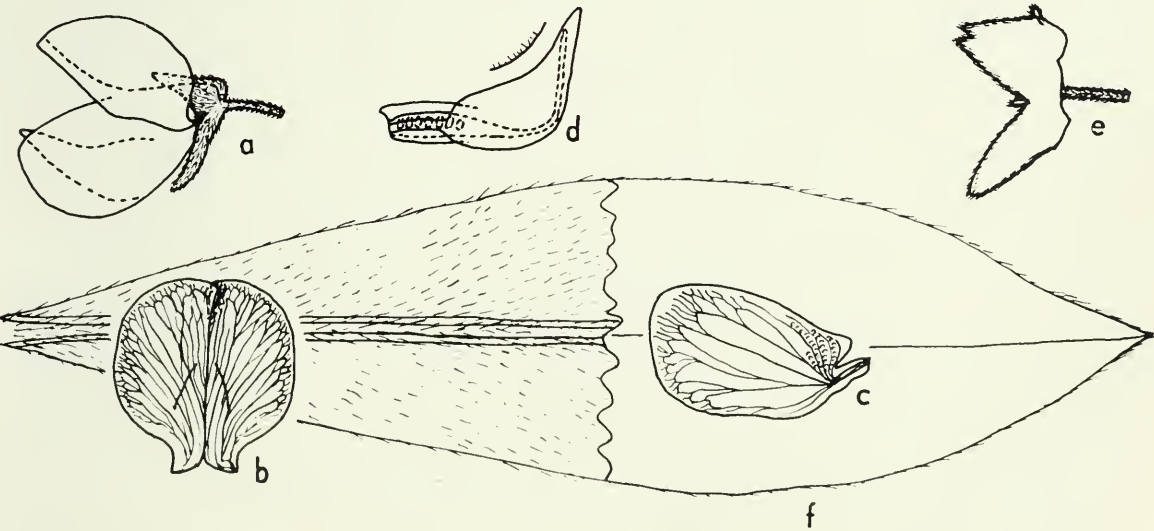


Figure 77. *Lupinus burkei* S. Wats. (a) flower; (b) banner; (c) wing; (d) keel; (e) calyx; (f) leaflet

and Idaho. The long persistent bracts and the very small flowers are quite far removed from *L. polyphyllus* Lindl. However, the effects of either introgression or a zone of evolutionary intergradation is apparent in southeastern British Columbia where *L. burkei* more closely approaches *L. polyphyllus* in appearance. Flowering from late May or early June to late July.

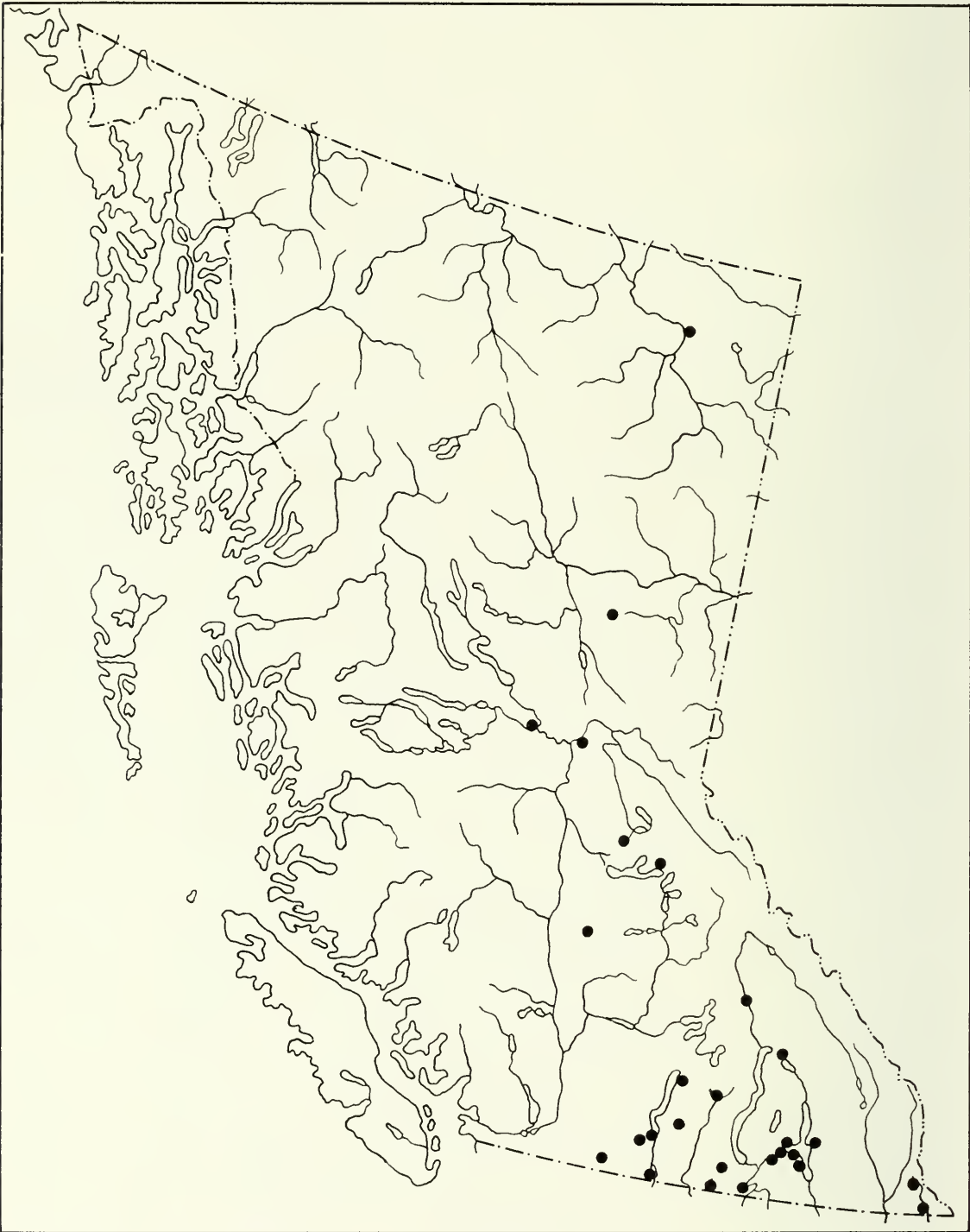


Figure 78. Distribution of *Lupinus burkei* S. Wats. in British Columbia

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